Teaching primary mathematics in Brunei Darussalam : the interplay between teachers' beliefs and practices.

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Teaching Primary Mathematics in Brunei Darussalam: The Interplay Between Teachers' Beliefs and Practices

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ABSTRACT

The empirical study which was carried out from July 1992 to March 1995 examines the interplay between teachers'beliefs about school mathematics and about mathematics teaching, and their instructional practices in primary schools in Brunei Darussalam. It builds on the work of researchers such as Thompson (1982, 1984, 1992); McGalliard (1983); Kesler (1985) and Lerman (1986) but examines the special factors in the educational context of a developing country, in Brunei Darussalam.

The methods of data gathering used in this study were interviews and classroom observations. The analysis was carried out by establishing the categories from the coding themes selected from the interview transcripts and observation notes. Phase 1 Study involved interviewing 12 teachers from 5 primary schools to elicit their beliefs about school mathematics, their beliefs about mathematics teaching and factors that teachers believed inhibited or influenced their mathematics teaching. The findings suggest that the teachers hold similar beliefs and perceptions. For these teachers, school mathematics mean numbers and "pseudo" word problems to be solved using the four operations. Teaching mathematics is mostly geared towards the examination.

On the basis that beliefs are not fully articulated until they are integrated with classroom practice, Phase 2 concentrates more on mathematics teaching in the classroom. Four of the 12 teachers from Phase 1 were selected for Phase 2. Each teacher was observed for two weeks in their classrooms. They were interviewed each day before and after

the observations were made. The teachers' practices were generally consistent with the beliefs they mentioned in Phase 1.

The findings from the study suggested that not only are individual teacher's beliefs consistent with their instructional practices but that the teachers have also been shown to be relatively homogeneous in their beliefs and practices.

The findings of Phase 1 and Phase 2 were validated by going back to the teachers. In order to provide triangulation Phase 3 was implemented. In this Phase mathematics education lecturers and school inspectors were interviewed about mathematics education in Primary schools in Brunei. Further analysis suggests that the Education system and the "modes of thinking" of the personnel from the Ministry of Education, the teachers, parents and the students also influence mathematics education in Brunei.

Finally, concerning the possible attributions of this study to mathematics education, 5 conclusions were drawn from the findings of the study.

Highlighted is the fact that the present system of education in Brunei is acceptable to all parties. Therefore, a recommendation for possible improvements to the present state of mathematics education in Brunei is made which involve a gradual adjustment to the existing Education system.

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CHAPTER 1

BACKGROUND OF THE STUDY

1.1 INTRODUCTION

The continuous drive for progress and improvement is part and parcel of contemporary life. In education, in general, planned change or innovation is a significant feature in this attempt for improvement. In some cases, change comes in the form of a new structure of education or the introduction of new curricula in schools. Some innovations simply come with the establishment of a new institution such as a University or Teachers' College and this may include the reorganisation of teacher training programmes, Whatever the form of change or innovation being introduced, the main objectives will always be to increase the opportunity for learning; equalise the opportunity between different groups in society; increase the efficiency and effectiveness in a way learning is conducted; enhance the relevance of the content being learned; and make the learning process a more meaningful and enjoyable experience.

In developing countries large proportions of resources are spent on education in order that it can play its role in national development. These countries have placed implicit faith in the rapid qualitative expansion of education as the most potent instrument for accelerated national development. They are determined to modernise teaching and improve both quality and quantity in education. In some countries, the effort to improve quality and quantity in education has led to a see-saw relationship as the improvement in quality then quantity have demanded attention. Usually besieged by the presence of numbers, the

focus of the improvement has to be concentrated on providing access to education for as many children as possible. There is increasing concern that this quantitative expansion has not always been accompanied by sufficient emphasis on improving the quality of education. In Brunei Darussalam, however, with a high percentage of children already in schools, it has become possible to devote greater resources to the more qualitative aspects of education.

1.2 The Education System of Brunei Darussalam

Immediately following Brunei's independence from the British in 1984, the "New Education System" was introduced in 1985 (See Appendix 1). Incorporated in the New Education System were the Bilingual System of Education and Malay Islamic Monarchy (MIB) concepts. The introduction of the New Education System, also known as the "Bilingual System", was not only seen as significant in terms of establishing a policy for the languages of instruction used in schools but also in terms of consolidating a national system of education for a newly dependent nation with its own culture and tradition. The introduction of the Bilingual system of education which was implemented in 1985 replaced the old division of the English, Malay and Chinese media of instruction. The new system recognised the importance of the English language for academic study, because of its ability to facilitate the entry of the students from Brunei Darussalam to institutions of higher education overseas, where the medium of instruction is English, such as universities in Singapore, Australia and the United Kingdom.

1.3 The curriculum for the Primary school in Brunei Darussalam

The main features of a centralised system of education are a common curriculum, and uniform examinations exist in Brunei Darussalam. The present primary schools curriculum is based on the framework of the 1983 National curriculum introduced in January 1983 through the Education Department Circular No 147/1982. A series of amendments were made to adjust to the Bilingual policy and the use of a new revised syllabus to adapt to the changes. The latest curriculum document, still enforced, is the Ministry's circular 1/02/86, effective from January 1987. This circular determines the location of periods for mathematics, General studies (history, geography, science and civic) as well as outlining the curriculum and aims of Pre-schools, Lower Primary and Upper primary education. The breakdown of the different schools subject for Primary schools are given in the Appendix (Appendices 11 and 111)

1.4 The University Brunei Darussalam

What is more significant to the study is the establishment of University Brunei Darussalam (UBD) in 1985. The idea of establishing a university in Brunei Darussalam was first raised during a comprehensive review of the country's higher education facilities in 1976. Subsequent discussions led to the appointment of a steering committee which, with the assistance of the British Council, proceeded to engage a group of experts to study and advise on the matter. However, active planning for a university did not commence until 1984, at which time academic links were discussed with a number of universities in the United Kingdom and Malaysia.

The Faculty of Education of the University incorporated in 1985, the Sultan Hassanal Bolkiah Institute of Education and its teacher training programmes, which had been established since 1956. The Faculty of Education sees its responsibility in teacher education as crucial for the overall quality of education in Brunei Darussalam. It's main purpose is the preparation of primary and secondary school teachers and educational administrators. One of the initiatives by UBD to improve the quality of education is to raise the certification standards of teachers by giving provisions for practising teachers who have at least two "A" levels and who are teaching in primary or secondary schools to attend degree courses at the University to upgrade themselves to graduate levels.

Besides the three year (for in-service teachers) or four year (for pre-service teachers) programmes for the Initial degree course in BA (Primary Education), short in-service courses (INSET) are also conducted for teachers in the schools by the Department of In-Service Education, Faculty of Education. Once again, the objective of INSET education is "to provide opportunities for teachers and schools administrators to acquire additional professional knowledge and skills" (Faculty of Education Prospectus, 1994/1995). From the above initiatives, teachers should receive more education in subject areas and better teacher training in general.

In the last Five-Year plan before the establishment of the new Five-Year Strategic Plan (1994-1999), UBD attempted to improve the quality of teachers and teaching through its pre-service and in-service training course since its establishment in 1985. Many primary teachers have attended these courses, and much experience has been accumulated.

If UBD has been successful in its mission, teachers should be able to teach more effectively. The question to ask is whether investment in money, time and efforts of all taking part, namely, the teachers and the teacher educators have produced the desired result. This is the general concern to be investigated in this study.

1.5 THE MATHEMATICAL CONTEXT OF THE STUDY

I joined UBD as a teacher educator in 1985, but before that I had been involved in teacher training for the last sixteen years through the Institute of Education in Brunei. In 1991 I was sent to the United Kingdom as a research student under the UBD "Local Development Scheme". My role as a mathematics education lecturer in UBD is the main reason why I am focusing in this study on school mathematics and mathematics teachers. Another reason is that school mathematics is generally perceived as a prestigious and important subject ant its visibility in the school setting has enabled it to become the focus of accountability debates.

1.5.1 The status of mathematics in Primary schools in Brunei Darussalam

In almost every educational system throughout the world, mathematics has come to occupy a central place in the school curriculum. The study of mathematics is regarded by most people as being a fundamental importance and therefore there is general agreement that every child should study mathematics at school. In Brunei Darussalam, the study of mathematics and science in schools is recognised as being vitally important because it is a "passport to Higher Education especially in Science and Technology" (The

Permanent Secretary of the Ministry of Education. Negara Brunei Darussalam, 1990). In his keynote address at the Fifth South East Asian Conference on Mathematical Education (SEACME 5) held in Brunei from 14 - 17th June 1990, the Honourable Minister of Education of Brunei Darussalam spoke of mathematics as being of fundamental importance to the development of Scientific and Technical skills.

> This attention to mathematics is justified by the important role the subject has in any modern society both from the viewpoint of the individual, for whom basic mathematical skills are of great importance in everyday living, and from the viewpoint of society as a whole in the acquisition of scientific and technological skills and even certain management skills.
>
> (p. viii)

Considerable importance is also given to mathematics in the school curriculum; for example, 12 periods out of a possible 45 periods per week are allocated to mathematics in Lower Primary classes and 10 periods per week for Upper Primary classes (MOE circular 1/02/86). At the end of primary schooling, all pupils sit for two mathematics papers in the Brunei Primary Certificate of Education examination (PCE).

1.5.2 Student achievement in mathematics

Schools and teachers are often judged by the performance of their students in the public examinations such as the PCE, Brunei Junior Certificate of Education (BJCE) and "O" and "A" levels. For a number of years in Brunei Darussalam, concern has been expressed about pupils' poor performance

in school mathematics in public examinations, such as PCE and BJCE. These concerns have been expressed in forums, seminars, speeches and reports by educators, planners, head teachers and teachers (Symposium of Head teachers, 1989; Rees, R., 1989). Pupils have been noted to shy away from mathematics or drop it altogether when given the opportunity to do so. Despite the efforts made by UBD and the Ministry of Education, in recent study analysing the performance of Brunei primary school children in Mathematics Paper 1 and 2 at the end of Primary 6 PCE examination, it was noted that the mathematics performance of students was still low (Lopez-Real, Maawiah & Veloo, 1992).

The table of results for mathematics in the PCE examinations from 1989 to 1993 is given in Appendix IV. From the table, the result for 1992 show 83.33% students got the pass grades A to D (grade E is fail) in both mathematics Paper 1 and 2. The pass mark for all subjects, including mathematics, differs from year to year, depending on the availability of places in Secondary schools. If, for example, a proportion of about 90% of pupils is required to be promoted to Form 1 (This is the average percentage required in all subjects and appears to be the approximate annual figure.) then the pass-marks for mathematics Paper 1 and 2 would need to be lowered to approximately 36% for mathematics Paper 1 and 22% for mathematics Paper 2 (Ibid. p 56). This would have an impact on the Secondary level. Mathematics is a hierarchical subject where the ability to proceed to new work invariably depends on a sufficient understanding of previous work. The pass-marks quoted above would mean that a large number of pupils would be proceeding to secondary education with a very poor performance in mathematics.

What is more alarming is the fact that the mathematics results of the students sitting for the PCE examination seem to be declining. For example, in the results of mathematics Paper 1 and Paper 2 in 1989, 30.74% of students got grades A and B, 27.72 got grades C and 30.35% got grades D while 11.19% failed. But in 1993, only 16.90% got grades A and B, 28.22% got grades C, 39.45% got grades D and 15.43% failed. Because of the poor results shown above, it seemed crucial to focus this study on school mathematics and mathematics teaching.

1.6. THE FOCUS ON THE TEACHER: The transfer of knowledge of teaching into the classroom

The focus on the teachers will highlight the scene in the classroom and bring classroom teaching into the centre of the stage. At the beginning of this Chapter, mathematics education in Brunei Darussalam was briefly reviewed. It showed that pupils' performance in mathematics was not satisfactory. To what extent have the teachers have a hand in this poor performance? This has never been investigated in Brunei Darussalam before.

The aims of Curriculum Studies for primary mathematics in UBD are:

> ...to help the prospective teachers to develop an understanding of how children learn mathematics and the factors that affect the learning of mathematics; acquire an understanding of the cognitive processes involved in primary mathematics through their own active involvement in the learning process; provide them with an experience of a range of instructional techniques

> essential for teaching mathematics in a primary school;...
>
> (Faculty of Education, UBD Handbook 1994/1995 p. 196)

Nevertheless it seemed that UBD's effort to upgrade the quality of the teachers' teaching has not shown any positive effect on the students' achievement.

Impressive as these developments which go on in UBD may be, one cannot lose sight of the real purpose for which they have been undertaken, as Hawes (1979) emphasise

> All educational endeavour comes to fruition at one and one point only - when the learner starts learning something...
>
> (p. 187)

This, of course, means that the ideas and materials generated by the development of the teachers have to reach the classrooms and become translated into appropriate experiences for the pupils. In short, knowledge actualisation remains a necessary practice for the teachers in order for them to fulfil their role in the classroom.

Research into teacher training has frequently drawn attention to an apparent "discontinuity" between programmes of training and the later classroom activity of the teachers to transfer the knowledge that they learn into classroom practice, Erault (1982) considers that the idea that knowledge acquisition precedes knowledge application is a "false assumption in the academic context" (p. 10). Erault explains that

> The ability to use certain ideas about teaching in academic essays or schools documents does not greatly increases the probability of being able to use those ideas in the classroom.
>
> (1982, p. 10)

My experience as a teacher trainer in 1972 when the New Mathematics Project was introduced in Brunei Darussalam in 1972 demonstrated to me that teachers have difficulties in changing their teaching strategies when they are in the classroom. The New Mathematics Project in Brunei Darussalam failed and was abandoned in 1978. According to the Controller of the Project, Dr. J.D McDonald, one of the Project's weaknesses was

> We have not forged a good link between teachers and the Department (the Project)...
>
> We are not in schools enough.....
>
> (Report of the New Mathematics Projects, 1978)

It seem that we were unrealistic in our expectations of students and teachers during the New Mathematics project era. The curriculum changes in Brunei Darussalam appeared to have been implemented without consideration given to the possible long-term problems associated with its real implementation in the classroom. We could not convince the teachers of the advantages of the "New Mathematics", in terms both of its content and "child-centred" approach of teaching. We failed to change the existing mathematics practice or to introduce mathematics teachers to the new methods of teaching.

Hence, the initiative failed to improve mathematics education. Instead, it engendered hostility among teachers both toward the project in terms of its "impractical ideas" and towards the teacher trainers for attempting to influence its practice in schools.

Poor experiences of the "New Mathematics" project in 1978 may have left a residue of scepticism with which any new curriculum innovation would initially be viewed. The experience mentioned above suggests that much has been lost by ignoring teachers' attitudes towards change.

Teachers are rational human beings, and as such they engage in the processes of thinking, making judgements, expressing beliefs and making decisions (Brown C.A, Cooney T,J., 1982). Researchers such as Nespor (1987), Clark (1988) also suggest that ***in order to better understand teachers' behaviours, another perspective is required, that is, a perspective focusing on the things and ways that teachers believe.*** These researchers went on to say that few people would argue with the proposition that the beliefs teachers hold influence their perceptions and judgements, which, in turn, affect their behaviour in the classroom, and therefore that understanding the belief structures of teachers is essential to improving their professional preparation and teaching practices.

1.7 TEACHERS' BELIEFS ABOUT SCHOOL MATHEMATICS AND THEIR BELIEFS ABOUT MATHEMATICS TEACHING

Although there is little evidence to link teachers' behaviours with students' understanding of mathematics in developing countries, some research suggests that teachers and schools demonstrate a stronger influence on overall

student academic performance. Heyneman (1976, 1980) has conducted two relevant studies; the first was his own research in Uganda; and the second was a re analysis of IEA data. Results of both studies suggest that teacher and school variables are important in accounting for variations in student achievement. Two reviews of predictors of student achievement in less developed countries (Avalos and Haddad, 1982; Husen et al 1978) have provided more support to Heyneman's findings.

I started this chapter by outlining some of the efforts made by UBD and the Ministry of Education to improve teachers' teaching skills in the classroom. The second part of this chapter outlined the importance of school mathematics education in Brunei and the failures to improve the mathematics performance of primary school pupils in the PCE examination. ***In an effort to avoid past mistakes, it would be sensible to look at reasons for such concerns. To date there is still no substantive research undertaken in Brunei Darussalam to try to identify the reasons why teachers have not been successful in implementing the ideas and practices espoused in their teacher training courses in the actual classroom. Therefore, this study will focus on the teachers and their teaching. Putting the teacher at the centre stage of the study will help to highlight some of the factors that promote or inhibit teachers' efforts to move towards the more varied teaching approaches they learned in UBD.***

I would argue that if we want to understand the work of these teachers, we have to understand what they take to be satisfying and meaningful both to them and their students. After all, according to Elbaz (1983);

> The teacher knows the social structure of the school and what it requires, of the teacher and the students, for survival and for success; she knows the community of which the school is part, and has a sense of what it will and will not accept...
> (p. 5)

It has become an accepted idea that teachers' ways of thinking and understanding are vital components of their practice. Ernest (1989) states that;

> Teaching reforms cannot take place unless teachers' deeply held beliefs about mathematics and its teaching and learning change. Furthermore, these changes in beliefs are associated with increased reflection and autonomy on the part of the mathematics teacher.
>
> (p. 249)

Other researchers have also indicated that teachers' teaching behaviour is influenced profoundly or subtly by what teachers believe mathematics should be (Fullan, 1983; Kesler, 1985; and Thompson 1984, 1992).

Other researchers such as Dougherty (1990) and Lerman (1983) also indicate that teachers' beliefs about mathematics and its teaching play a significant role in shaping the teachers' characteristic patterns of instructional behaviour. This study therefore originates from the premise that;

> ...to understand teaching from teachers perspectives we have to understand their beliefs with which they define their work.
>
> (Nespor, 1987, p. 323)

Nespor (1987) goes on to say that;

> ...if we are interested in why teachers organise and run classrooms as they do we must pay attention to the goals they pursue...and to their subjective interpretations of classroom processes.
>
> (p. 323)

Therefore the central focus of this study is to investigate teachers' beliefs about school mathematics and mathematics teaching and about factors which inhibit or promote their mathematics teaching.

But not all teachers' beliefs about school mathematics and mathematics teaching are reflected in their classroom practice. This has been indicated by Brown (1985) and Cooney (1985). There are cases where, within a single study, both consistency and discrepancy between teachers' professed beliefs of school mathematics and mathematics teaching and their instructional practices exist. For example, the study by Cooney (1985) on Fred, a beginning teacher, described the tensions and conflicts Fred experienced between his strong views of mathematics teaching, which were favouring problem solving strategies, and the "milieu of classroom life" (Cooney, 1985, p 336).

Jackson (1968) seemed to provide the answer as to why there are discrepancies between teachers' beliefs and their instructional practice. He suggested that teaching consists of two phases, the preactive and interactive and each of these phases is characterised by a different type of cognitive activity. Jackson argued that in the preactive, or planning, phase of teaching when teachers are out of

contact with the children and the classroom but thinking about their work, teachers' thinking appears to be problem-solving oriented (McCutchen, 1980). But when the teachers are face to face with the children in the classroom, with a syllabus and timetable to follow, they make numerous decisions about the planning of the classroom work. This usually involves decisions as to who is to do what, when and how with the materials.

On the basis on the above arguments concerning the discrepancies between the teachers' beliefs and their instructional practices, this study also looks at the interrelationships between teachers' beliefs about school mathematics and mathematics teaching and their practice in the classroom. This will be explained in the second phase.

Ernest (1989) identifies two key elements of teachers' beliefs:

> 1. The teacher's mental contents and schemes, particularly the system of beliefs concerning mathematics and its teaching and learning.
>
> 2. The social context of the teaching situation, particularly the constraints and opportunities it provided, and the teacher's level of thought processes and reflections.
>
> (P 249)

Some researchers have used the term *culture* or *ethos* to describe the features of a group of people which go toward making up their beliefs and their intentions. It is important to understand the cultural background and ideology behind the Education Policies if an attempt is going

to be made to explain why teachers operate in a particular way. Bates (1986) defines *culture* in these terms:

> It is culture that gives meaning to life. The beliefs, language, ritual, knowledge, convictions, courtesies and artefacts - in short, the cultural baggage of any group are the resources from which individual and social identity are constructed. They provide the framework upon which the individual constructs his understanding of the world and of himself.
>
> (P 55)

The "cultural baggage" according to Bates is the way a group of people work, which requires an appreciation of complexity of any organisation and knowledge of all the various aspects that combine to characterise this group. According to Bates:

> Part of this baggage is factual. It is empirical, descriptive, objective. Another part of this cultural baggage is mythical. It is concerned not with facts but with meaning. That is, the interpretative and prescriptive rules which provide the basis for understanding the action.
>
> (P 55)

The "factual" aspects referred to by Bates are the size, age and qualifications of teachers, timetable, syllabus, textbooks, calculators, specialist teachers etc. While the "mythical" aspect is the beliefs, the intentions and the way which teachers view mathematics, children, teaching and learning, the rapport between teachers and between teachers

and parents etc., in other words "rules which provide the basis for understanding and actions." (P 56)

In any teaching and learning situation, the teacher is the key person in implementation. In other words, he/she to a large extent, determines what actually occurs in the classroom. His/her performance, however, is affected by the support (or lack of support) he/she receives from the professionals, such as the mathematics education lecturers from the University and the school inspectors from the Ministry of Education. Therefore, these professionals are involved in the teachers' teaching, each with a distinct role to play. In order to gain further insights into the state of mathematics education in Brunei Darussalam, the Mathematics Education Lecturers and the School Inspectors will be included in this study.

The intention of the third phase of the study is to illuminate the outcomes of the study from the first two phases in relation to the perceptions held by the Mathematics education Lecturers and School Inspectors about mathematics education in Brunei Darussalam.

This study takes the account of primary school teachers' beliefs about school mathematics and their beliefs about mathematics teaching and instructional practice in the classroom. The teachers' beliefs are collected from the interviews I had with the teachers in 1992, while their instructional practices are collected as the result of my interviews and observations in 1993. Further details of the objectives of the study, the rationale of the research methodology used, the selection of the teachers and the methods used to analyse the interview transcripts and classroom observation notes will be given in Chapter 2.

CHAPTER 2

THE RESEARCH METHODOLOGY

2.1 Introduction

In Chapter 1, I have outlined the components of my research, which are contained within a context. They include the status of mathematics in Primary schools in Brunei Darussalam, students' achievements in mathematics, the focus on the teacher, teachers' beliefs about mathematics and mathematics teaching, and the analysis of the socio-political and educational context of Brunei Darussalam. In this chapter, an account of the methods I adopted and the processes I pursued in conducting the empirical component of my study will be outlined.

The empirical evidence in this study was conducted in three phases, the aims of which were:

Phase 1: To investigate teachers' beliefs about school mathematics and mathematics teaching and factors that they believed inhibit or promote their mathematics teaching in the classroom.

Phase 2: To look at the interrelationship between the teachers beliefs about school mathematics and their beliefs about mathematics teaching and their practice in the classroom.

Phase 3: To illuminate the findings of phases 1 & 2 by examining these in relation to the perceptions and views held by the mathematics education lecturers and the school inspectors in Brunei Darussalam.

2.2 RATIONALE FOR THE METHODS

I should like, at the outset, to acknowledge my bias for a more "naturalistic" mode of inquiry in educational research

and a general scepticism towards the classical quantitative methods embedded in the methodology of natural sciences which, as summed up by Robinson (1974), "has produced some sophisticated and elegant statistical techniques but has done little to enhance man's understanding of man" (P 252).

Since the early 1970s there has been a steady accumulation of literature to indicate the shift in emphasis in educational research from the traditional to alternative paradigms (for example, Wolcott, 1975; Hamilton et al. 1977; Simons, 1980; Burgess, 1985).

In traditional studies in the field of natural sciences researchers regard themselves as detached observers, totally unaffected by the subject under study as well as from its possible outcomes. Apart from the fact that contemporary 'natural' scientists are more concerned with the notion of probability than with absolute universal laws, many scientists stress the human emphasis even when they deal with inert substances. Bronowski, for example, relates science with its human origin, and emphasises that:

> Knowledge in general and in science in particular does not consists of abstract but of man-made ideas, all the way from its beginnings to its modern and idiosyncratic models... discoveries are made by men, not merely by minds, so that they are alive and charged with individuality.
>
> (1981, P 10)

Furthermore, sociological research differs significantly from natural sciences research in that it deals with people and their interactions with each other and their

environment, not with inert substances. The sociologist must be acutely aware that researchers and their subjects are people who inevitably interact, and are influenced by each other's perceptions (Blalock, 1977). Inevitably then, this study of teachers' beliefs in Brunei Darussalam will be influenced by an interpretative sociological approach which, as Worsley has argued, stresses that;

> ...the 'internal' world can only be known to us through the operation of our minds, and that our minds are not blank, but furnished with mental structures which affect our perception and understanding of the world.
>
> (1977, P 10)

The interpretative approach recognises that empirical data, regardless of their scientific origin, are collected, selected and interpreted by sociologists as human beings. Thus the sociologist is able to bring to bear the 'human consciousness', that is, the ability to act and react, to think and speculate, to recall and project. These human attributes go well beyond the mere collection of empirical data.

In such a study one cannot ignore the Marxist emphasis on the definite interrelationship that exists between sociology as a science and sociology at large. Both the sociologists conducting the research and the actors being researched form part of a larger complex, all influenced by the particular situations, concerns and occurrences taking place at a particular point in time. The behaviour of an individual, whether conventional and accepted or deviant and abnormal, tends to have an impact not only on the individual concerned but also on the other members of the

community. Expected behaviour reinforces the conventional norms of the group; deviant behaviour creates a social problem which is noted or ignored depending on its impact. The point is, then, that the social enquiry of individuals leads to the study of those individuals in relation to their peers. The search for an understanding of the daily lives of individuals must necessarily be set against the norm operating in their social organisation. Furthermore, efforts are made to attune this work to Weberian view that sociologists and society are intertwined, that sociologists have to take into account the existence and actions of others. Such an approach is particularly relevant to enquiries in the field of education, and this study takes good note of Gintis' (1972) complaint that researchers in education often failed to remember that educational research takes place in a social context, and that they tend to treat education as if it exist in a social vacuum.

Thus, there is a good case for adopting a framework which accepts an emphasis on empiricism. With regard to my study, my substantive interest in the beliefs of the primary mathematics teachers and their practices in the classroom, hopefully, could provide a basis for further understanding of the problems encountered by these teachers in mathematics classroom in Brunei Darussalam. Understanding of such phenomena could, sooner or later, be used in attempts to improve the mathematics teacher education courses in University Brunei Darussalam (UBD).

In developing a theoretical framework for this study, care has been taken to guard against the danger of inherent in a rapid application of the hypothetico-deductive method which starts from hypotheses that reflect one's own assumptions, and proceeds within a structure that reinforces those

hypotheses and the writer's point of view. Instead it is important to be guided by Kuhn's (1962) emphasis on the relative nature of observations, and his theory that discoveries are often made when the expected results fail to materialise. Such an approach is more likely to enable the researcher to broaden his/her vision, to incorporate the views and assumptions of others, and to regard the situation as others see it. Such precautions become particularly pertinent in a study where I have been involved, sometimes intimately, in the Bruneian educational system for the last twenty years. And similarly where my own deeds and decisions may have had some influence on the professional development of other teachers. The process of this research has forced me to re-examine my own perceptions about teachers, their teaching, as well as the school about which I had accepted many assumptions in the past, including my own role as mathematics education lecturer.

On the positive side, such a position permits accessibility to inside knowledge demanded by the interactionist and grounded-theory approach as proposed by Glaser and Strauss (1964), or the phenomenological blend favoured by many sociologists (Blalock, 1965; Borgatta, 1971). Indeed, Nisbet argues that research directly related to one's regular work allows the researcher to get "inside the skin of the situation" (1980. P 6), and suggests that this type of research is more likely to lead to action and innovation.

I hope that this study will provide a stepping stone towards further efforts to improve the standard of mathematics education in Brunei Darussalam. So far much efforts have been made without the backing of research.

However, one has to be cautious about making predictions. Even if one accepts the sociological position that an inquiry of contemporary situations becomes unavoidably interlaced with events from the past and orientations towards the future, no researcher can be absolutely certain that his/her predictions will prove correct. This study, therefore, attempts to highlight some of the problems associated with mathematics education in Brunei Darussalam and, at the same time, to avoid the temptation of being prescriptive, and to avoid offering absolute solutions. In the process it follows Taylor's advice (1973) keeping in focus the aim to make people aware and sensitise them to an educational problems in the hope that they will be willing to do something about it.

The approach adopted in this study is therefore eclectic. It incorporates findings from other sources such as interviews with other educational personnel who have direct links with the teachers, namely the mathematics education lecturers in UBD and the school inspectors, Some documentary evidence on the educational system and empirical data resulting from a field-study are also included.

2.3 PHASE 1: The interviews

One component of the research methods employed in this study as a means of gaining data was the interview.

However, this method is not without its "danger-zone". Furthermore, one of the inevitable consequences of the study was a heavy reliance on the interview as a means of gaining data. Walker (1974) has commented on problems which

the SAFARI team encountered with interviews as a research tool. Drawing on the work of Hortense Powdermaker, he suggests that there are two important concepts in interviewing: 'psychological mobility' and 'emotional intelligence':

> Psychological mobility is a phrase used by the American anthropologist Hortense Powdermaker to describe the fieldworker's ability to 'step in and out of the role of people with different value systems'. She ascribes her failures in conducting a study of the Hollywood film industry to her failure to make the psychological transitions smoothly.
>
> (P 102)

In an interview, the person who is being interviewed may react either in favour of or against what he perceives as being the interviewer's own beliefs. Thus the interviewee may either tell a story which he believes the interviewer wishes to hear, or he may take issue with what he sees as the interviewer's beliefs. In either case, Walker argues that the interviewer must be psychologically mobile, or else he may be dominating and controlling that which is said. Quoting from Hortense Powdermaker, Walker warns:

> Conscious involvement ~~are~~ is not a handicap for social scientist. Unconscious ones are always dangerous.
>
> (P 102)

The other problem for the interviewer is to empathise with the interviewee. Walker uses the expression 'emotional intelligence' to describe this concepts. He suggests that:

> It is not enough simply to be self-aware and to know your own values are entering the situation. You need to enter the world of the other.
>
> (P 103)

Thus it is necessary for the interviewer to have an understanding of the interviewee's feelings and beliefs if the interview is to attempt to achieve its objectives and to start to reach towards the truth of the situation. The teachers, in the case of my study, were assured beforehand that the aim of my study was to highlight the problems they have in teaching mathematics in the classroom, and that my role was not that of mathematics lecturer but a friend and a researcher attempting to understand their situations. The process and procedure which I took to safeguard their anonymity will be explained further in this Chapter.

However, this aspect of interviewing has a particular relevance for this research. In other words, this study needed to consider the case when the researcher has other roles besides that of the researcher and the interview situation may reveal issues which may (or may not) be relevant to the research, but which could impinge on the other roles. In dealing with this problem, Walker advises:

> Overall perhaps the main problems with the interview is that it releases more of the truth than the case study worker can handle. Consequently the basic value of the interviewer is respect for the privacy of the interviewee and a recognition that people own the facts of their lives.
>
> (P 104)

In so far as was humanly possible, Walker's guidance was followed and every attempt was made to differentiate between my two roles (i.e. researcher and teacher educator).

All of the interviewed teachers had the purpose of the research explained to them at the start of the interview. Confidentiality was guaranteed, They were also guaranteed that data collected in this study would not be used for any other purposes. Every teacher was asked if they objected to the use of a tape-recorder to ensure a true record of the interview and all the teachers who took part in the study allowed a tape-recorder to be used.

Details concerning the selection of the teachers who took part in the study, and data collection and recording will be explained in the latter part of this chapter (Section 3 and 4 respectively).

2.4 PHASE 2: Interview and Classroom observation

The decision to use classroom observations and unstructured interviews before and after the observations was guided by assumptions which are commonly associated with research concerning teachers' beliefs, which can be revealed when they are interviewed away from their classroom. Although research such as that described by Thompson (1984) indicates that teaching behaviour is influenced profoundly or subtly by what teachers believe mathematics and mathematics teaching should be, actual teacher behaviours may not always be consistent with their theories. Case studies (Thompson. 1984; Cooney. 1985; Brown, 1986) have shown that there can be a great disparity between a

teacher's espoused models of teaching and the models actually realised in the teaching of mathematics.

An understanding of the teacher's situation must take into account the subjective reality experienced as well as the context which influences him or her. Therefore in Phase 2, research techniques of partially non-participant observation and interviews for obtaining teacher feedback were used for a variety of purposes. The former were to enable me to collect detailed data on verbal as well as non-verbal behaviour and in natural settings; only through observations could the salient features and subjective elements of teaching be revealed; these data, though valuable in their own right, could also reveal some of the questions to be asked in the interviews to be made after each observation. Furthermore, they could be used to create an informal relationship with the teachers observed, resulting in a greater 'naturalness' of the data collected. I had the opportunity to interact more closely with the teachers who took part in the study by holding interviews with them both before and after the lesson I observed. This allowed them to explain what they were going to do in the classroom and what they had done in the classroom. Qualitative research depends a lot on such relationships. According to Burgess, (1985); "the main research instrument is the researcher who attempts to obtain a participant's account of the situation under study" (P 8), therefore the quality of the data obtained from the research must be dependent on the quality of the relationship with the key participants.

The interviews conducted after the classroom observation, particularly I felt, had the potential ability to elicit personal views, attitudes, perceptions, understanding and

interpretations and to be used to provide a source of information about the teachers' rationale for their action and also to provide an insider perspective on the culture of the classroom and on salient events of classroom life. In addition, they may possibly open up new dimensions of a problem.

The data collection in the Phase 2 study involved using an audio tape recorder and the observation required me to write down my ideas and perceptions into a notebook, especially during the classroom observations. The tapes were then transcribed in their entirety during the evening following the interview session. Separate tapes were used for each teacher.

2.5 PHASE 3: Interviews with the mathematics education lecturers and the School Inspectors

To link the teachers' beliefs about mathematics and mathematics teaching and their instructional practices to the wider social context of the school and the Education Policy in Brunei Darussalam, another source of data was needed. In February 1995, it was decided to involve the Mathematics Education lecturers and the School Inspectors in the study since they are directly linked to the teachers through pre-service teacher education, in-service education and supervisions.

The methods used to generate data for Phase 3 was semi-structured interview, in the sense that the lecturers and the school inspectors are free to give their views and perceptions about mathematics education in Brunei, but I also had a list of questions to make sure that the interviews covered the agenda that I had set earlier

(Appendices VII and VIII). It was my desire that, not only could the data generated from the interview transcripts provide the relationship of the findings of Phase 1 and Phase 2 to the social context and Educational Policy in Brunei Darussalam, but also it could be used to verify and substantiate the teachers' beliefs and practice.

2.6 THE METHODOLOGY

2.6.1 Sampling

For Phase 1 of my study. I choose five primary schools, one from each of the four districts in Brunei Darussalam and purposely selected two primary schools from the biggest district, Brunei/Muara. Using the list of schools given to me by the School division of the Ministry of Education I chose the first school from the list of schools for each of the four districts and the second school from the list of schools in Brunei/Muara.

Before being given official permission, I had to visit the five schools to talk to the Headteachers about my intention to conduct my study in their schools. In keeping with the rules of the Brunei culture, which is to respect the host I asked the Headteacher to choose two teachers to take part in the study. The disadvantage of this procedure was that the Headteachers might choose the teachers who they feel are the best teachers in the schools. However, I do not believe that the selection of the teachers by the Headteachers made much difference to my study, since the number of teachers teaching in the Upper primary classes is small. It so happened that out of twelve teachers five were male and seven were female; and four teachers who hold Certificate of Education while eight were graduates.

All the schools were familiar to me through my previous role as mathematics education lecturer and I had visited the schools during Teaching Practice. Thus all the Headteachers were known to me as well. This familiar aspect of the relationship gave me an additional advantage, in accordance with Schatzman and Strauss (1973) recommendations:

> ...if the researcher knows the general scene quite well through prior experience gained elsewhere, then he has some additional advantage, since he can check what he hears against that experience.

My experiences confirmed this and I was thus able to identify and establish a) more refined questions and theoretical ideas and, b) more precise area of concern.

Phase 2 of the study was conducted about a year later in 1993. The study was a follow-up of the Phase 1 study with four of the previous twelve teachers. I needed to obtain sufficient data from each of the four teachers to give a valid base for reference. Since I had only 4 months to spent in Brunei Darussalam, this time frame provided a maximum of 2 weeks of interviews and observation for each teacher.

The decision to involve in Phase 2 the same teachers who had participated in Phase 1 was made because there was a need for continuity in the study as well as a basis for comparison between their espoused beliefs about mathematics and mathematics teaching and their practical teaching in the classroom.

From the analysis done for each teacher who took part in Phase 1, it was apparent that there were only slight variations between them in terms of their beliefs and perceptions about mathematics and mathematics teaching in Brunei Darussalam and the problem and their need for support in their roles as mathematics teachers. The criteria for selection rested finally on the categories drawn up according to 12 teachers personalities and attitudes to mathematics and mathematics teaching in the hope that the differences would be reflected in their teaching. Therefore, two of the teachers (ND and HM) were selected for Phase 2 study because during the interview in Phase 1, they had shown:

a) more reflection than most of the teachers interviewed. For example ND was "unhappy with the way the content (of the textbook) is presented...we not really using the textbook, we use our own exercises...better we look for different exercises." (ND Q9 P2)

b) an emphasis on the students' "understanding" in teaching mathematics. For example HM gave as a reason for not following the prescribed scheme of work: "...in my opinion it is better to teach the children until they understand, that is better." (HM Q5 P2)

c) a preference for group work. They divided the class into small groups, although, as most of the teachers mentioned in the interview, this was for practical reasons, such as the use of a limited number of teaching aids.

d) that they used teaching aids for teaching "selected" topics.

Two other teachers (NA and MH) possessed some of the above characteristics too but they were selected for the following reasons:

a) These teachers had a more negative attitude to mathematics teaching. For example NA mentioned that "if it is really our interest (teaching mathematics), I don't think so. Some of the subjects in the school curriculum we have to teach it since we are in primary schools. We have no choice...: (NA Q22 p6).

b) They followed the scheme of work and textbook rigidly. MH, when asked the type of teaching method that could be used to achieve the objectives mentioned in the syllabus (18), said that "...in the textbook, still we use the method, borrowing, like that. No other method. So teachers still teach the same method...(Why?). But in mathematics we have to teach according to textbook isn't it? (MH Q18 p3).

The first pair of teachers showed better initiatives and flexibility towards teaching mathematics compared to the second pair of teachers. It would be interesting to find out if there would be differences in the utilisation of their resources (namely, their beliefs, ability, talent and knowledge) while coping with teaching mathematics in the classroom in similar teaching environments. The findings will be reported later in Chapter 4 and 5.

Phase 3 was conducted in February 1995. There were 6 Mathematics Education lecturers in UBD and 5 of them took part in the interview. One of the lecturer was on maternity leave at the time the interview was conducted. Besides these lecturers, 2 primary mathematics specialist School Inspectors also participated in the study.

2.6.2 Gaining Access

Schools can generally be regarded as closed systems so that sponsorship is required for entry. In Brunei Darussalam there is a standard procedure for this which I followed. In July 1992, I wrote a formal letter to the Director of schools, Ministry of Education seeking for permission to do research in the schools. I specified that it would involve interviewing 12 teachers in 5 primary schools starting from the last week of July 1992, and later on starting in July 1993, interviewing and observing these teachers teaching mathematics in the classroom.

I received a reply from the Director of Schools on 22nd July 1992 giving me permission to conduct my research in the schools (Appendix V). I was also reminded, in the letter, that a copy of my thesis was to be summitted to the Ministry as soon as it was ready. My first research project which was Phase 1, was well underway by the end of July 1992.

2.6.3 Development of Interview Questions for Phase 1

The interview questions for Phase 1 were developed by undertaking the following procedures:

a) Preliminary reading of literature resembling similar research conducted by various writers in the past to get acquainted with the style of interview questions,

b) Development of the first draft of the interview questions before consulting my supervisors.

c) A series of consultations and critiques sessions of the first draft of the questions with my supervisors.

d) Trialling the questions on two MA Mathematics Education overseas students studying at the Centre of the Educational Studies, Kings College, University of London.

e) Finalising the questions with my supervisors before using them with the teachers taking part in the study in Brunei Primary schools in July 1992.

2.6.4 The Final Form of the Interview questions

The questions to be used in the structured interviews were divided into 8 sections. The questions were broad and varied covering all possible aspects of mathematics education in Brunei Darussalam. it was my intention that these questions would be able to begin to uncover teachers' beliefs, attitudes and perceptions about mathematics and mathematics teaching. In the process, factors that teachers believe that could help to promote or inhibit their mathematics teaching were highlighted. After reading several case studies (Brickhouse & Bodner, 1992; Cronin-Jones, 1991; Duschl & Wright, 1989) I expected to find constraints such as logical reasons to provide an explanation for why teachers are unable to act according to their beliefs. Accumulated evidence of this nature was gathered to provide adequate support for reconstructing a general picture of the teachers' teaching, their beliefs and the link between the teachers' beliefs and their relationship with their students. These evidences provided a basis for coding themes in the analysis later on.

The question were divided into 8 sections (see Appendix VI). These sections were:

Section 1: Lesson planning and teaching styles.

This section hopefully provided a starting point for the discussion of issues pertaining to mathematics teaching. I selected classroom teaching because that is of interest to me, a subject about which I wish to know more. Lofland and Lofland (1984) advise encouraging people to begin where they are, not with answers but with interests, passions, and questions. Teachers were asked to reflect on the planning they did before teaching, the teaching of their most recently taught topics and how they and their students perceived the lesson.

Section 2: Resources

The main aim of this section was to find out more about the methods of teaching mathematics that the teacher had used most recently and also to find out teachers' beliefs and perceptions about the utilisation, relevancy, availability and management of other teaching resources in their schools.

Section 3: Classroom organisation

Referring to the most recent topics they had taught, the teachers were asked to describe how their classes were arranged, the reasons why the classrooms were arranged in that particular way, and who decided on the way the classroom were arranged. These questions were included according to the premise that the key to effective classroom management lies in creating an effective learning environment for the students and that means reflecting on the part of the teachers.

Section 4: Curriculum (content and objectives)

The aim of this section was to find out teachers' beliefs and perceptions about the curriculum with regard to its objectives, choice and arrangement of content. This section was also used to find out teachers' beliefs about the teaching methods espoused in the curriculum and their actual teaching in the classroom.

Section 5: Training (pre-service and in-service)

The aim of this section was to find out teachers' perception of their pre-service and in-service training courses, and how they influenced their teaching. They were also asked if they require further training in mathematics teaching. And if they do, what type of courses they need to help them teach mathematics in their classroom.

Section 6: Supervisions

This section was used to find the type of supervisions teachers received throughout their teaching career, and their perceptions of these supervisions and their supervisors.

Section 7: Assessment

Teachers were asked specifically about the type of assessment and examination they used in their classrooms and their perceptions of these.

Section 8: Others

This section provided the opportunity for additional

questions arising from the brainstorming session. Issues that were mentioned by the teachers but did not fit the original sections mentioned above were included here. For example, issues which were associated with teachers' perceptions of teaching mathematics in English, the use of calculators and specialist teachers.

2.7 DATA COLLECTION AND RECORDING

2.7.1 PHASE 1: The interview

The focus of the study in Phase 1 was ***the teachers' beliefs about mathematics and mathematics teaching.*** In the process, ***factors that teachers believe influenced or inhibited their mathematics teaching were also highlighted.*** According to Thompson (1992):

> A teacher's conception of the nature of mathematics may be viewed as that teacher's conscious or subconscious beliefs, concepts, meaning, rules mental images, and preferences concerning the discipline of mathematics. Those beliefs, concepts, views and preferences constitute the rudiments of a philosophy of mathematics, although for some teachers they may not be developed and articulated into coherent philosophy.
>
> (P 132)

This is definitely true in the case of Brunei Darussalam, where teachers are seldom asked "what are your beliefs about mathematics and mathematics teaching?" Even if they could answer such a question, I doubt that they are capable of describing their "beliefs". Teachers sometimes do not

possess the appropriate language with which to describe them, or teachers may be reluctant to air unpopular beliefs; and beliefs appear to be highly contextualised with respect to specific classrooms, events and students (Leinhart, 1990). In this case, I decided to explore the teachers' beliefs indirectly through their perceptions about factors which are directly relevant to their role as mathematics teachers where they can recount events that occurred in their classrooms recently, as Hartley et. al (1976)

> ...if therefore, teachers are more at ease discussing the particular than the general then it must be from the former that their ideologies are to be imputed...

and through discussions about factors surrounding their mathematics teaching such as: the syllabus, assessment, training and support. It is from the data generated by these interviews that I needed to infer underlying beliefs.

I shall describe in some detail here my interviews conducted in both Phase 1 and Phase 2 as the interview data contributed substantially to my study. July 1992, soon after the Headteachers had assented to my request to interview their teachers and had given me their names, I contacted the teachers individually by phone and then met them personally to discuss a suitable date, time and place for the interview to take place. I made sure that the interviews would be held at their convenience. As it happened, most teachers chose to be interviewed during their free periods and the Headteachers usually offered their offices for the venue of the interview sessions.

At each interview I followed a certain procedure. First of all I explained the reasons for wanting to interview them - that I was a research student interested in understanding more about teachers' beliefs about mathematics teaching in Brunei Primary schools, as well as about teachers' perception about factors surrounding mathematics education the curriculum, the assessment/examination, supports, resources and so on. Since the teachers were directly involved with mathematics teaching in the classroom, I was sure that they could enlighten me a great deal on what mathematics teaching was about. Being actually conscious that I was known to these teachers, and that I was involved directly with their mathematics education in the Institute of Education or UBD, I was at pains to assure them that the interviews were strictly for research purposes, and that I was not there to evaluate them as I had been when I was their mathematics education lecturer. I also assured them that all the information they gave me would be confidential and that their anonymity would be ensured. None of the teachers challenged me over this.

In fact, all of the teachers expressed that they were happy to see me again, and relieved that they could share their "experiences" of teaching mathematics with me.

A note must also be made of the language used in the interviews. During the interviews I gave the teachers option of speaking in either English or Malay, "whichever language you are more comfortable with". Most of the teachers spoke English, resorting to Malay only for certain technical terms used in the syllabus or whenever they felt that they needed to stress certain points. Some of them spoke in both languages, a blend of English and Malay, as is often the case during conversations among English-

educated Bruneians. In this thesis I have translated the Malay conversations into English, attempting to stick to the original meaning as far as possible,

2.7.2 Unstructured interview

The unstructured interview was conducted with 4 teachers in one primary school in the State. This was not part of the study, nor were any of the teachers and the school. The purpose of conducting the interview was to let the teachers talk freely their perceptions about mathematics and mathematics education in Brunei Darussalam. I did not participate much in the session. It was restricted to the opening statement when I asked them to express their perceptions about mathematics and mathematics education by saying "Can you tell me what is your perceptions about mathematics education in Brunei" and pointing out to them the topics that they could touch on, such as "What about the syllabus?" and so on.

The unstructured interview facilitated flexibility, free responses and also allowed the widest possible exploration of views and perceptions to be produced by these teachers. The data from the interview were used as a basis for modification of some of the questions that had been prepared earlier for the actual study and which made up the structured interviews of the 12 teachers from 5 primary schools. Some questions could be used to pursue unexpected new topics.

2.7.3 The structured interview

Interviews at this stage were conducted on a one-to-one

basis, usually taking place in the Headteacher's office. As described above, the questions for this interview had been prepared earlier and responses from the unstructured interviews done earlier were used to formulate into further questions to ask individual teachers. The final list of interview questions is included in Appendix VI. The interviews were closely directed, with the interviewer controlling the order and even the wording of the questions but at the same time some unstructured elements were evident in the sense that the interviews were more like conversations and there was flexibility. At this stage twelve teachers from five primary schools took part in the interviews. And each interview lasted for about forty minutes to an hour.

It was gratifying that most teachers talked freely and I resorted to my agenda or probed only when necessary. I tape-recorded all the interviews, with the teachers' prior permission. At the same time, I took brief notes or made quick summaries of what they said.

2.7.4 PHASE 2: Interviews and classroom observation

Phase 2 of my study involved the use of the interview and the classroom observation of 4 primary teachers.

2.7.5 The interviews

To shift the locale of judgement from the researcher to the participants, the interview technique was incorporated within the classroom observation. Interviews were conducted both before and after the classroom observations. The interviews were unstructured but at the same time they were

not altogether non-directive as I had an agenda of topics to be covered. Generally the primary purpose of the interview with the teacher before the classroom observation was to elicit from the teacher his/her planning of the mathematics lesson, his/her objectives and the teaching strategies he/she intended to use. While the interview after the classroom observation was to gain more insights into what was going on in the classroom, and teachers' explanations of what they believed to be going on in the classroom and why. Usually the questions I asked were spontaneous in the sense that once a conversation had started, the questions I asked, in the main, followed up what the teachers said.

Since most mathematics periods were arranged first thing in the morning, arrangements were made with the Headteacher of the school to release the teacher involved from supervising daily school rituals such as school assembly and cleaning campaign, so that the teacher could be interviewed for about average of half an hour before the lesson. This interview helped me to elicit the unstated plans, which were not made obvious in the lesson plan, and also helped me to see if the lessons plan were really carried out in the classroom.

The interviews after the lessons were conducted as far as possible directly after the observations were made, or, if the teachers were not free, the period after, during break time, or whenever the teachers were free, but in every case on the same day of the observations. The interviews were based on the fieldnotes taken during the observations. This enabled me to move the discussions of the teaching beyond the visible acts. They were designed to complement the observational techniques particularly on issues which were

not overtly demonstrated during the observation period. For example, at one stage of the lesson, HM, one of the teachers took part in the study, asked three of his students to go to the back of the classroom while he continued his demonstration on the blackboard. I was not sure why he did that. During the interview later, HM explained to me that the three students were the students who had missed the class the day before because of other school commitments, and he intended to explain the contents of that lesson to them separately from the rest of the class.

Other areas that were included in the interviews were: a) the teachers' knowledge of the subjects using questions such as "Were you confident of teaching the topics?" b) classroom pedagogy and teachers' performance; and c) the continuity or discontinuity in the teacher training as well as the effectiveness of their pre-service training in the light of their classroom practices and experiences.

2.7.6 The classroom observations

I came back to Brunei to conduct my Phase 2 study in July 1993, about a year after conducting my Phase 1 study. The time in between the two Phases was used for analysing the interview transcripts of the 12 teachers and formulating the framework for Phase 2.

My past experiences of observing in classrooms had been connected with evaluating teacher trainees during the Teaching Practice sessions. As I was embarking on an observation of a totally different kind, I decided to "pilot" it first. For this purpose I chose a close friend who is a primary school teacher who agreed that I observe

her teaching mathematics for a week. During this "pilot", I learned to minimise my practice making judgements on the teacher's teaching while I was observing her, as I had been accustomed to doing during the Practical Teaching with pre-service teachers. In the "pilot" study, I also learned to record the observations I made to selected areas that were significant to my study, such as teacher's lesson presentations, use of teaching materials (teaching aids, textbooks, workbooks etc.), classroom management, and interaction between teachers and pupils.

Only after this experience, did I embark on the first classroom which I observed for two weeks. After observing and interviewing one teacher, I gave myself a week to sort my data collected from that particular teacher before starting my second classroom observations. This schedule was followed until all the four teachers were interviewed and observed. All and all, it took me about twelve weeks to collect data for my Phase 2 study.

Let me outline my experiences throughout my Phase 2 study. As mentioned earlier, I was known to the teachers as their mathematics education lecturer who had, in the past, observed them teaching mathematics in the classroom when they were student teachers. This was not an easy task for the teachers to discard. Therefore, I had to remind them again and again that my presence this time in their classrooms was not in any way connected with evaluating them, that I was only interested to see how they conducted mathematics lessons in the classroom. Therefore I asked them to be as "natural" as possible,

For my part, I was warned by my supervisors about stepping over the line between being a researcher/observer and my

role as teacher educator. During my "pilot" study, I tried as far as possible to differentiate between my research role and my teacher educator role. Among the observational limitations was the structural constriction of occupying an existing role. When one actually performs a role necessary to or at least already built into the setting, one must necessarily use a good part of the time playing out that role. This means that the researcher is not free to wander about and play any other roles freely. For example, I was known to the teachers involved as someone they could turn to if they were in difficulty as far as mathematics teaching was concerned. This was voiced out by ND (31/8/93):

> Usually I asked, I asked my colleagues (overcome her problems). It is difficult now, madam. When we were in the Institute it was easy to talk to the lecturers, now I don't know. We never had the chance to talk to our lecturer. like yourself again...

People everywhere tend to need help; their circumstances are a draw on one's moral involvement with them. This raises the question of how far and in what ways the observer could be permitted to become involved.

During the observations in the classroom I tried my best to be inconspicuous and to maintain a non-participant role, but it was not easy to be completely detached when observing from the rear of the classroom. Sometimes the teachers directed comments especially to me, and there were occasions when they came to the back of the class to engage me in conversation. Most of the time, I managed to

discourage the teachers by "pretending" to be busy writing some notes in my notebook and avoiding looking directly at the teachers when they were teaching. Such experiences have been encountered by other researchers as well (for example, Hammersley, 1984).

Despite my "pilot" study, my unstructured observations resulted in a great many detailed fieldnotes. I took copious notes at first but later concentrated more on what observations seemed to be significant in relation to my original aims. For example, I noted down the teachers' presentation strategies, individualised or group activities, use of teaching resources, interactions with the students.

Besides observing in the classrooms, I had the opportunity to meet other teachers and joined in the staffroom conversations about the school in general. During this Phase, I also had the opportunity to speak to the Headteacher almost everyday about mathematics teaching in particular and the school in general, because I was invited by the Headteachers to their offices for morning tea break. Thus at the end of the observation periods I had accumulated fieldnotes not only of the classroom observations but also informal conversation with other teachers and the Headteachers of the schools.

It is important to note here that the data collected during the classroom observations played very important of the study, as Walker (1973) noted:

> Direct observation is only procedure that allows one to observe the behaviour as it occurs in natural situation, thus reducing the chances of making incorrect assumptions.

What I was able to do was to use my observations to add extra pieces to the jig-saw of beliefs, perceptions and values of the teachers. Particularly in Phase 2. I was able to document what really happening in the classroom.

2.7.7 PHASE 3: The interviews with the Mathematics Education lecturers and the School Inspectors

Phase 3 was conducted only after the analyses of Phases 1 and 2 had been partially finalised which was in February and March 1995. The questions to be used in the interviews had been prepared earlier (Appendix VII and VIII).

No selection procedure was required because all the Mathematics education lecturers in UBD with the exception of a lecturer who was on maternity leave, covering the whole of Brunei Darussalam took part in the interviews. There were only two Mathematics Specialists School Inspectors in Brunei and both of them agreed to be interviewed.

The mathematics education lecturers were interviewed in their own rooms in UBD, while the school inspectors were interviewed in the offices in the Ministry of Education. In all cases, they agreed to an audio taped recorder being used in the interview.

2.8. ANALYSIS OF THE DATA

2.8.1 Analysis of Phase 1 study

After all the time spent collecting data and conducting interviews during the Phase 1 study, I had time only to transcribe all the interview tapes (twelve tapes of one hour each) while I was in Brunei. This proved to be time-consuming.

I came back to London with the interview transcripts in November 1992. I was anxious to work on the materials. I was not sure what to do with them, although I was guided by my supervisors to read some literature on qualitative research and data analysis such as Strauss and Corbin (1990).

2.8.2 Selection of Coding Themes

To provide information on where a particular coding "came from", it is important to mention here that the "start lists" of codes were directed by the conceptual framework of the study, interview questions, the aims and objectives that I brought with me to the study. For example, my interest was in identifying the teachers' beliefs about mathematics and mathematics teaching. In the process, I was interested in finding out the factors that influence teachers in realising beliefs for example the factors that inhibit them from using varieties of other mathematics teaching methods in their classroom.

2.8.3 How the coding themes were categorised

Using the coding themes selected earlier for the design of the instrument, the next step was to look for categories that linked the themes together. Obviously, there were variations to how these teachers expressed their beliefs and perceptions, but there appeared to be considerable consistency within the statements. For example, the following excerpts from the interviews were brought together under the same category, namely, "Teachers' beliefs about the type of mathematics teaching that could help students to acquire skills in learning mathematics":

...to be able to acquire the skill Students must manipulate things, and do the things.

(HM Q18 P4)

Using activity. using activity so that they can acquire the skill.

(RT Q18 P6)

Well, of course, it is obvious isn't it? That we have to use activity methods when we want the children to understand...

(JK Q18 p4)

I think the teaching method should be activity oriented, because to acquire skills is not easy is it? The pupils have to manipulate, to deal with this and that, so the pupils have to do some sort of activity...

(NA Q18 P5)

In the naming of the categories, the following methods seemed to be helpful in this particular study:

1. the grouping of the statements were based on the responses given by the teachers to a particular question in the interviews, which generated similar answers. For example, interview question 18 was "What kinds of teaching methods, would you think, are most appropriate to achieve these kinds of objectives?" (i.e. as stated in the syllabus). Some examples of the answers given by the teachers are given in the quotations above.

2. Some similar statements taken from the teachers' responses across the interviews were extracted from the transcripts and listed under the same category. For example, under the category "Teachers' beliefs about mathematics teaching" these statements were included:

> The lecturer taught us different teaching styles of teaching mathematics. I really like the activity methods we did in UBD, It was interesting. I am sure my students will enjoy that too...
>
> (RJ Q22 P5)

> ...other teaching aids, concrete ones like for introducing shape, like cylinder...sometimes I asked them (the students) to make boxes. It is interesting, and the students enjoyed it but it takes time.
>
> (ASB Q8 P3)

Other categories included in the data analysis were teachers' beliefs and perceptions about:

1. their students
2. their knowledge of the subject matter
3. their confidence in teaching mathematics
4. the support they get from various authorities
5. the availability and relevance of teaching resources
6. the curriculum
7. the communication between the teachers and the various personnel in the Ministry of Education
8. examinations and assessment
9. the influence of their pre-service and in-service training.

I presented the data in the form of a report. I noticed that although the report provided a rich source of information about the teachers' beliefs about mathematics, mathematics teaching and other factors that linked up to the mathematics education, it did not fit the original aims of my study. I referred back to the interview transcripts again. This time, I use pre-arranged categories and looked for data to add to these categories from the interview transcripts. I then analysed them according to the aims and objectives of the study. These were a) identifying the teachers' beliefs about mathematics and mathematics teaching and b) identifying factors which the teachers believed influenced or inhibited the teachers from practising such beliefs. The categories that were included in the analysis of the Phase 1 study were classified under 3 sections: Section 1 - identifying teachers' beliefs about school mathematics, mathematics teaching and examination. Section 2 - Teachers' attributions which they believed inhibited their mathematics teaching; and Section 3 - Methods that teachers said they used to overcome the problems in teaching mathematics in the classroom.

2.8.4 The analysis of the Phase 2 study

The data analysis of the interviews for Phase 2 was more complicated then that for Phase 1. This was because the interviews were unstructured: as such I did not have prior ideas of the codes I was going to use. The procedure for coding the data from the interview transcripts was done by highlighting the themes, line by line as they occurred in the interview transcripts.

Establishing categories from qualitative data was quite a difficult exercises. It entailed a balancing operation, on

the one hand to distil categories, while on the other trying to keep these categories within the broad picture so that each category was truly a part of it. Several ways were tried to produce tentative categories from the interview transcripts. Experts such as LeCompte 1984; Lofland and Lofland 1984; and Miles and Huberman 1984, have explained how they work to establish categories: for example, analysing the transcripts line by line (Glaser, 1978 P 57). and writing the codes and comments on the margin, underlining terms used in the transcripts and constructing tentative labels for these terms. Presenting the data in these ways resulted in my having too many constructs, too much repetition and too little analysis or comments.

This led to frequent consultation sessions with my supervisors who kept remaining me to "play with the data" and "always look back at the aims of the study". The method I finally adopted was: a) line by line, I marked the codes I felt to be significant to the study; b) after I had gone through the whole interview transcripts for each teacher, I then cut out all the codes and; c) arranged and rearranged them according to similar themes; d) put each coding theme on a separate sheet of A4 paper. This procedure was repeated for the other teachers as well. It was later decided that the categories generated from the interview transcripts were 1) the teachers' attributions of their own ability and skills in school mathematics and mathematics teaching; 2) the teachers' attributions of their students' ability and motivation to learn mathematics; and 3) the teachers' beliefs about school mathematics and mathematics teaching.

In some respects, analysis of the observational data took place even when I was carrying out the observation. As I recorded events in my fieldnotes, I was at the same time making some preliminary interpretations. This was specially so during the later stages of the classroom observations, when events had become more predictable. In the margins of my fieldnotes I wrote, in red ink, words such as "teaching strategy", "classroom control". "students' response", "questioning techniques" and so on. Later when observations had been completed I read through all my fieldnotes several times and noted down similar incidents that could be classified under one broad category. For example, "teacher's teaching strategy"; "students' role during teacher demonstration" etc.

In the final analysis of Phase 2, the data generated from the observation notes were used to highlight the teacher's practice in the classroom. The categories were: 1) the teacher's teaching practice - the strategies that the teacher used in the mathematics classroom; and 2) the teacher's relationship with his/her students in mathematics classroom. These categories were used to build a profile of each teacher in the form of a case study.

2.8.5 The analysis of the Phase 3 study

Although, at the beginning, as mentioned in the section on Data Collection and Recording (Section 4), I intended to use structured interviews, later, during interviews conducted with the Mathematics Education lecturers, it proved difficult to keep up with the questions because all lecturers favoured unstructured interviews. However, I used structured interviews with the School inspectors.

The data collected from the interviews with 5 Mathematics lecturers and 2 School Inspectors as expected, have provided me with rich, varied and detailed data. The interview transcripts were analysed line by line and categories were developed according to the method of coding and selecting themes used in Phase 1 and Phase 2 studies. The categories were made relevant to the present state of mathematics education in Brunei. Therefore they included such categories as the lecturers and school inspectors' perceptions of an ideal mathematics classroom, the present scenarios of mathematics teaching in Brunei Darussalam as observed and perceived by the lecturers and the school inspectors.

The analysis of the data for Phase 1, 2 and 3 and the literatures as the basis for the analysis would be included individually in the preceding Chapters of this thesis.

2.9 Respondent Validation

The profiles of the teachers were developed from the interview transcripts and the observation notes. These profiles were presented to the teachers who were "portrayed" (anonymously) in terms of accuracy and fairness in August 1994 as Validation 1. Wood (1986) described "respondent validation" as:

> ...returning the processed account to the informant for appraisal. There are two levels in which this may prove useful. Firstly in checking the accuracy of the data...Secondly, on any interpretation or explanation, the informant may have some useful comments to make,
>
> (P 86)

Besides checking for the accuracy and fairness of my interpretations of the teachers' personal profile, lists of teachers' beliefs taken from the interview transcripts were prepared to form Validation 2 (Appendix IX). These lists were also presented to the teachers to find out which of the beliefs stated in the lists were agreeable to them and which were not. This was used to find out whether the teachers agreed with belief statements given by other teachers in the study, statements which they had not had the opportunity or had forgotten to mention in the interviews, although they felt strongly about them.

The "respondent validation" provided further insights to teachers' beliefs about school mathematics and mathematics teaching. These validations were used in the Case studies (Chapter 5) and the synthesis of Phase 1 and Phase 2 study (Chapter 6). In any case, it was considered a necessary part of the process due to the ethical framework of my study.

THE SCHEDULES OF THE RESEARCH

PHASES	DATES	SAMPLES	METHODS OF DATA COLLECTION	AIMS
1	July to September 1992	12 teachers from 5 primary schools	1. Unstructured interviews (not to be included in the analysis) 2. Structured interviews	To investigate teachers beliefs about mathematics and mathematics teaching
2	July to September 1993	4 teachers from Phase 1 study teaching in 4 primary schools	1. Unstructured interviews before and after observations 2. Observations of mathematics lessons (2 weeks per teacher)	To look at the interrelationship between the teachers beliefs and their instructional practices

Respondent Validations	August 1994	4 teachers from Phase 2 study	Interviews based on: 1. Teachers' brief profiles constructed from Phase 2 2. Lists of beliefs statements and teachers' practices from Phase 2 study	1. To validate the accuracy of my interprepations 2. For additional data in the analysis
3	February to March 1995	5 mathematics education lecturers 2 school mathematics specialist inspectors	1. Unstructured interviews for the mathematics lecturers 2. Structured interviews for the school inspectors	Triangulation of the data collected for Phase 1 and 2

CHAPTER 3
PHASE 1: THE INTERVIEWS

3.1 The Analysis and Interpretations of the interviews

This chapter will describe the analysis of the data collected for Phase 1. The research methodology used at this stage of the study was structured interviews with 12 teachers from 5 primary schools in Brunei. It was conducted from July 1992 to September 1992.

The aim of Phase 1 was;

To investigate teachers' beliefs about school mathematics, their beliefs about mathematics teaching and the factors that they believed inhibit or promote their mathematics teaching in the classroom.

The interview transcripts provided me with rich data concerning mathematics education in Brunei. The technique used to analyse the data was coding themes and categories, as suggested in Glaser (1978, p 57); the method of the analysis used has been explained in Chapter 2 on Methodology. The first section on the interpretation of the interviews in this chapter is to highlight; (A) the teachers' beliefs about the school mathematics which was to be taught to the students, (B) their beliefs about mathematics teaching and the process involved in transferring mathematical knowledge to their students, and (C) their beliefs about the examination system. The second section is to identify the teachers' attributions of the students' performance which they believed to have been inhibiting them from teaching mathematics as well as they would have wished. A third category emerged in the course

of the analysis and which had not been originally anticipated in the aim for Phase 1. This category forms of the third section of this analysis which aims to highlight certain teaching methods, viz. those which the teachers said that they used to cope with the factors they believed inhibited their mathematics teaching.

In the following sections, I shall use the teachers' own words as sub-heading to describe their beliefs and attributes where appropriate.

3.2 SECTION 1: IDENTIFYING TEACHERS' BELIEFS ABOUT SCHOOL MATHEMATICS, MATHEMATICS TEACHING AND EXAMINATION

A. The teachers' beliefs about school mathematics is that most school mathematics is made up of "numbers and words problems involving the four operations" (HM Q6 p 2)

Although there are separate sections for teachers' beliefs about school mathematics and their beliefs about mathematics teaching, it is difficult to separate the teachers' beliefs about school mathematics without making references to their beliefs about mathematics teaching and vice versa. The teachers' beliefs about school mathematics were not explicit in the interview transcripts, but implicit in the ways the teachers expressed their teaching objectives, lesson planning and even in the description of the teaching methods they used in their most recent mathematics lessons.

The belief that "school mathematics mostly include numbers and word problems involving the four operations" was mentioned by the teachers throughout these interviews. One such example of where the teachers' beliefs about school

mathematics was extracted from the interview transcripts was when the teachers mentioned the content of mathematics topics which were included in the textbooks supplied by the Curriculum Development Department, Ministry of Education, Brunei. According to ND:

> All mathematics topics include the four operations and word problems as shown in the textbooks and the workbooks. Every topic done the same way in the textbook, first, the examples and then the exercises. Always start with addition, subtraction and then multiplication and division and then the word problems.
>
> (ND Q9 p 2)

The following are the instances where the teachers beliefs about school mathematics were found to be embedded when they explained about the planning of their lessons, their beliefs about the use of calculators and other factors relating to their mathematics teaching.

i) Most of the teachers believed that planning mathematics lessons involved only "looking for exercises"

All the teachers in this study admitted that they did some lesson planning before their mathematics lessons. 9 out of 12 teachers in fact indicated that their lesson planning usually involved looking for the exercises (numbers and word problems) based on the topics to be taught. The most often cited comment made by these teachers regarding their lesson planning, which was echoed by HM, was "a week before teaching the topic, usually I have to find the proper exercises in other textbooks." (Q5 p 1).

The duration the teachers took in planning their lessons and the sources from where these mathematical problems were selected varied according to the topics they were about to

teach. Nevertheless, the planning still revolved around "looking for exercises". NA, for instance, was teaching Geometry when I interviewed her in 1992. According to her:

> ...the duration of the preparation depends on the topic, more difficult topics usually need longer time to look for suitable exercises. For this topic (geometry), what I've seen from the workbook, I use that. Sometimes we have to find other exercises from other books.
>
> (NA Q5 p 1)

Other examples of the teachers lesson planning which could be considered to indicate the teachers' beliefs about school mathematics as mostly numbers and word problems, were mentioned by MH and RJ. According to MH:

> I prepare a lot of questions for them (the students) before coming to the class.
>
> (MH Q13 p 5)

And RJ said that:

> For example, next week I want to teach a topic. I started to look for good exercises, find out how to introduce the lesson, what are the homework I want to give, like that...
>
> (Q5 p 1)

ii) The teachers believed that using calculators would mean that the students' "mind will not be used to calculate" (NA Q34 p 8)

Another indication of the teachers' beliefs that school mathematics is made up of "numbers and word problems

involving the four operations" was evident when all the teachers voiced their disagreement about the use of calculators in teaching mathematics in primary schools. It seemed that all 12 teachers believed that using calculators deprived their students from developing the skills of doing calculations using their heads, which skills seemed to them fundamental to learning mathematics. For example, all the teachers interviewed believed that calculators should not be used in the primary school classroom because calculators stopped the students from achieving the skills of manipulating numbers using the four operations, which are the basis of learning mathematics. The extracts below are some of the examples of the teachers' beliefs about the use of calculators and the repercussions of such usage, if allowed in the primary schools, which could be considered to be an indication of the teachers' beliefs about school mathematics. These extracts were taken from the interview transcripts:

> I am really against it (using calculators) at this stage because it is actually not suitable for pupils. This is basic (primary schools). They should be taught mathematics how to find answers and doing their calculations using their heads.
>
> (SAG Q34 p6)

> I am afraid they will depend on the calculators everytime. With calculator also they can get the answer straight away. How? they cannot show the working isn't it? It is not really them who are doing the work. It is the calculators. I am afraid they will not use their brains.
>
> (HM Q34 p6)

These beliefs about the use of calculators seemed to highlight not only the teachers' beliefs about school mathematics but also give an indication of the teachers perceptions that developing the ability and skills of the children in routine problems which required calculations using the four operations was fundamental in learning mathematics. Using calculators to calculate would remove the very reason to do mathematics in a mathematics lesson. They did not seem to value the abilities which the use of calculators could encourage, for example, identifying the operations, estimation, approximation and so on.

iii) The teachers believed that "to be able to do mathematics, students must be good with their multiplication tables" (RJ Q7 p2)

Related to the beliefs described in (i) and ii) about the use of calculators, other indications which pointed towards the teachers' beliefs about school mathematics mentioned above were the teachers' perceptions about the importance of the multiplication tables (or "times tables" as it is known to most teachers in Brunei) in learning mathematics. The skills involved in multiplication tables were mentioned by all the teachers with the exception of NA who, referring to her Geometry lesson during the interview, said that the key to success in mathematics was using the four operations. One example is cited by HM:

> ...they (the students) are not good at tables. We feel the problem is there, don't know their time tables...
>
> (Q2 p1)

These teachers believed that students who were poor in

multiplication tables would not be able to pass the mathematics examination however hard the teachers tried to help them. For example, when asked if his lesson on Decimals was successful, JK stressed the importance of knowing the multiplication tables:

> Some of them, those who are very good in their multiplication tables at least they can do. But some lazy, lazy ones, still cannot understand however hard we try. Even though we have taught them individually.
>
> (Q1 p 1)

iv) The teachers believed that to solve word problems only requires students to identify key words and clues because "in word problems there are usually key words given." (ASB Q7 p 2)

Occasionally, the teachers made references to their beliefs about school mathematics when they mentioned their teaching methods, especially about to teaching word problems to students who were "poor in English" (SAG Q35 p 6). The teachers realised that their students had difficulty in understanding mathematics lessons, especially those which involved word problems as mentioned by NA:

> The problem is, all the word problems are in English. Children don't understand what the questions are. So this is the problem.
>
> (Q36 p9)

The strategies that these teachers said they used to overcome this language problem further indicate the teachers' beliefs about school mathematics. These beliefs made it convenient for the teachers to assume that they

could simplify their mathematics teaching by turning the word problems into step-by-step computation. This shows that the teachers have to teach their students how to look for "keywords" and "clues" to identify the operations needed to solve these word problems. For example, NA went on to say:

> Sometimes we use key words. What to do? like "together" means "subtract". We use that rather than they cannot answer do the exercises.
>
> (Q36 p9)

Difficulties with word problems, as mentioned above, were often associated with their poor understanding of the English language. But the teachers did not seem to try to make the students understand the structure and the concepts embedded in these word problems. Probably they were right not to do so given the situation where mathematics is taught in a foreign language. They simply taught the students how to look for "clues" or "keywords".

The factor that made the teachers feel confident in using the type of teaching method mentioned above was the way word problems in textbooks, workbooks and in the examination questions were formulated, which seemed to further suggest that the beliefs about school mathematics were not only held by the teachers but also the planners and examiners. For example, according to ASB:

> Because word problems in the textbooks and workbooks usually the clues and the key words given. Then I will just underline the sentence with coloured chalk. I said "This is the key word. This is the question asking you what to do.'
>
> (Q7 p3)

Although teaching mathematics in English could contribute to the teachers' choice of teaching strategies for teaching word problems, this procedure could also be made possible because the teachers believed that mathematics word problems were stereotyped vehicles for the manipulation of numbers. As such, the teachers' beliefs also suggested they knew that word problems, especially in mathematics textbooks, workbooks and mathematics' question papers used in the examination contained "pseudo problems". These beliefs would, unfortunately, influence the teachers' beliefs about mathematics teaching and learning as a whole.

B. Teachers' beliefs about mathematics teaching which involved the students "doing a lot of exercises" (RJ Q2 p 1)

Most of the phenomena which will be used to highlight the teachers' beliefs about mathematics teaching in this section have been mentioned in the previous section. As stated in the beginning of this Chapter, it is difficult to separate the two beliefs, highlighting one and not mentioning the other.

In relation to the teachers' beliefs about school mathematics mentioned above, the predominant belief about mathematics teaching seemed to be focusing on giving the students the skills to do mathematics exercises, particularly from textbooks, workbooks or previous examination question papers, as in the case of Primary 6. The message that came across in the categories from the interview transcripts was that students must learn the procedure of doing mathematics using the four operations if they are to learn and be competent in the subject. The following extract, cited by one of the teachers in the interviews was quite typical of what the other teachers were saying:

> All mathematics topics include all the four operations and word problems. For me, right now, I am teaching Decimals. I am not sure how long I am going to finish it. So far I had spent almost two weeks on this topic and I only reach division.
>
> (JK Q15 p4)

The teachers' role was to look for and prepare such mathematical exercises to be used as seat work in the classroom, particularly those exercises which are similar to the examination questions, and to make sure that their students have the necessary expertise and skills to solve these problems. My assumption about the teachers' objectives was to be supported later when the analysis started to look at the way that the teachers relate their teaching objectives directly to their efforts to making their students able to do the exercises given to them, to their preferences about student behaviour, and to evaluating their lessons.

i) Teachers' beliefs about mathematics teaching as seen through their objectives in teaching mathematics.

Embedded in the statements the teachers made about their objectives of teaching mathematics was their efforts to teach their students to answer the "pseudo" mathematics problems at the end of each lesson. These exercises no doubts were geared towards developing the skills needed for the examination at the end of the year. This was confirmed by ASB when he said:

> ...you just give them exercises. In the examination, that is what people want to see.
>
> (Q2 p1)

The skills that were to be perfected were basically the ability to manipulate the four operations embedded in the word problems which could be found in the mathematics textbooks, workbooks and examination question papers in Brunei. Exercises and more exercises were given to the students, especially when the teacher realised that the topic was difficult for the students to do, in the hope that the students would become skilful in answering the questions and doing the types of exercises that they were going to see again in the examination. For example, RA explained to me about her students' ability to learn the topic that she was teaching at the time of the interview:

> My topic is weight. Kg and gm. I just ask them (the students) to do the exercises on the blackboard. I find that division so difficult for them, so I gave them plenty of exercises to do.
>
> (Q1 p1)

Another teacher, ASB, commented that the teaching methods he used might help the students to answer most of the mathematics questions given to them, which was all that was required of him and his pupils, if the examination requirements are taken into account. But ASB was, nevertheless, doubtful that these methods could help his students to develop their understanding of the concepts of mathematics:

> If they (the students) can answer correctly, that means I achieve my goals. But for concepts, concepts maybe not achieved...The problem is, to be frank with you, we are examination conscious. If I want to go in-depth with concepts then takes

> time. Here in Brunei, if your pupils pass the examination, then it is considered okay.
>
> (Q2 p 1)

Since examinations are an important part of the culture of teaching and learning in Brunei, a notion supported by the teachers, (see section C of this Chapter) the teachers would try to find ways and means to improve the examination results of their students. One of the ways of doing this was to give frequent tests, according to NA:

> The aim is to reinforce, to reinforce what they have learnt...I had the experience before. When I gave them frequent tests, the examination results better.
>
> (Q30 p7)

ii) The teachers' believed that their mathematics lessons are successful when "most of the pupils can do all the exercises" (RA Q3 p1)

To evaluate the success of their mathematics teaching, these teachers mentioned that it all depended on their students' ability to answer the questions based on the day's lesson. It seemed that the teachers' evaluation of their mathematics teaching was defined by their view of the validity of the knowledge they were to transmit to their students. Most of the teachers referred to the importance of developing skills during a mathematics lesson in order to successfully do mathematics exercises at the end of the lesson. This, they regarded as the valid method of transmitting the necessary knowledge to their students. In other words, what counted as a successful or unsuccessful mathematics lesson was the number of questions that all the

students were able to answer at the end of the mathematics lesson. For example, ASB's evaluation of his lesson, representing most teachers' was:

> Usually depends on the exercises. If I see that most of them can do the exercises, that means more than three quarter (of the questions) it means my lesson is successful. Because if less than half, obviously the lesson was not successful. Probably calculations they cannot do so I repeat again.
>
> (Q1 p1)

The teachers' beliefs about mathematics teaching were also seen to be related to their beliefs about the examination system in Brunei. As mentioned by ASB, also quoted earlier:

> ...you just give exercises. In examination, that is what people want to see.
>
> (Q2 p1)

Therefore in the following section, I will try to highlight the teachers' beliefs about the examination which are conducted twice a year for all the primary schools in Brunei.

C. The teachers' beliefs about the assessment and examination system in Brunei

There are two types of examinations for each class level for both primary or secondary schools, namely: the mid-year examination, usually conducted in June/July of each year, and the end-of-year examination, usually conducted in October/November. Besides these examinations, monthly tests

are also conducted for all levels. The most important examination in primary schools is the Primary Certificate of Education (PCE) examination. This examination is conducted nationally, for Primary 6 (aged 11 or 12 years old), usually in October.

All the teachers interviewed agreed that the present system of examination in Brunei is "still the best method of assessment" (HM Q32 p5). The following extracts give some of the reasons mentioned by these teachers for supporting the examination system:

> I think the present method of assessment is good. It helps us to be on our guard.
>
> (SAG Q32 p6)

> So far this is the only way we can see which pupils can be promoted to secondary schools. So I think it is okay.
>
> (RA Q32 p5)

> Well, I agree with the examination. It is still good way for us to revise our lessons and test if the children understand or not.
>
> (RJ Q32 p6)

The teachers' beliefs about the positive role of examinations also show that it was not surprising that the teachers should favour doing exercises as the main method of mathematics teaching, since the type of examination that had been introduced in Brunei seemed to encouraged this. The reasons are two-fold: (1) the types of mathematics questions asked in the mathematics examination question

papers, (2) the frequency of these centralised and school-based assessments, and the examinations that students had to sit for in a year.

One of the methods that teachers used to prepare their students for these assessments and examination was giving their students regular revision work. Particularly for Primary 6 teachers, revision work formed an important part of their everyday mathematics teaching, as mentioned by RA:

> As early as August, we are not doing real teaching, but revise and more revision everyday. We usually use previous papers to make our students familiar with the questions. Examination is in October, we really have to do more revision now.
>
> (Q31 p5)

Besides giving their students lots of exercises and revision work to familiarise their students with the examination questions, teachers also gave them frequent tests, usually once a week, for the same reason. NA, quoted earlier in this Chapter, related the benefits of giving her students frequent tests. According to her:

> ...the tests, for them to revise what they have learnt. Sometimes, after a long time, they will not remember the lessons they already learned. So that's how we can revise. I had the experience before. When I gave them frequent tests, the examination results better.
>
> (Q30 p7)

NA's statement suggests that tests help the students to learn mathematics which provides another reason for

teachers to approve the present form of assessment in Brunei. And therefore, their mathematics teaching is geared towards the examinations.

Another factor which is important with respect to the examination is the scheme of work. The teachers believed that the examiners set the examination questions following the topics in the scheme of work. In fact they felt this was essential, although they were also pressurised to cover all the topics in the scheme of work. As mentioned by RJ:

> They (the examiners) follow the scheme, so we have to be careful about the scheme.
>
> (Q30 p6)

SUMMARY OF SECTION 1

The analysis for Phase 1, so far, has highlighted the teachers' beliefs about school mathematics, their beliefs about mathematics teaching and their beliefs about the examination. The interrelationship between these beliefs are obvious. It seems that these beliefs affect one another. For example, teachers' beliefs about mathematics teaching could be influenced by teachers' beliefs about the examination and, at the same time, teachers beliefs about school mathematics could be influenced by their beliefs about mathematics teaching and the examination. However, the teachers seemed to accept these beliefs, particularly about the examination, as the rationale for the selection of their teaching methods.

The only criticism the teachers had about their mathematics teaching concerned their own confidence and abilities, the

students efforts, the relevancy of teaching resources and the adequacy of the supervision and support they received during their teaching careers. The following section will highlight these attributes which, the teachers considered in one way or another, had inhibited or influenced their mathematics teaching in the classroom.

3.3 SECTION 2: TEACHERS' PERCEPTIONS OF WHAT THEY BELIEVED HAD INFLUENCED OR INHIBITED THEIR MATHEMATICS TEACHING

As mentioned earlier, the teachers who took part in the study had well-established beliefs about school mathematics and examinations. They also had well-worked out beliefs about the nature of mathematics teaching which could enable the transmission of mathematics knowledge to the students in order that they could pass the examination. Because of the teachers' concern for their students to have good results in the examination, they looked for ways to make the teaching more appropriate to their students' needs and, hopefully, at the same time, more effective. There are, however, factors that the teachers felt inhibited them from improving their mathematics teaching. These factors were as follows:

i) Some of the teachers attributed their own lack of ability and lack of confidence as one of the factors which inhibited their mathematics teaching

In this study, not only did teachers voice concern about their lack of "content knowledge", which Shulman (1986) describes as understanding the facts and the concepts of discipline as well as the method and rules that guide syntactic structures, but also "pedagogical content knowledge", defined by Shulman (1986) as the ways of

presenting and formulating the subject that make it comprehensible to others as well as understanding what makes the learning of specific topics easy or difficult. These feelings of inadequacy eventually led to the teachers having a lack of confidence in teaching the subject.

For example, these teachers voiced their concerns that a lack of confidence in teaching mathematics may have inhibited them from attempting to change their teaching methods, which may have helped to promote their students' ability to understand their teaching. For example: MH confirmed that teachers used only "methods in the textbooks" (MH Q2 p3). She went on later in the interview to say:

> ...it is difficult to teach some other ways to the children because we are not confident ourselves.
>
> (Q33 p5)

Also SAG said in the interview that:

> There are teachers who are not confident to teach mathematics, you know. So how do you expect us to teach properly.
>
> (Q33 p6)

Teachers' lack of understanding the concepts of mathematics too, according to HM, will affect the students' understanding of those concepts which the teachers are attempting to put across to their students. HM went on to say:

> Sometimes I feel confused how to do this or that, because I have not really understood the concept myself. You see, it's a problem. You know, if you don't understand yourself, how? You cannot make pupils understand, isn't it?
>
> (Q33 p6)

This lack of mathematics content knowledge was confirmed by 7 out of 12 teachers, who admitted in the interviews that they were not good in school mathematics. This was reflected in the statements made by two of the teachers:

> Actually I am not very good with mathematics, my academic achievement is really...not good, only Form 5.
>
> (ASB Q3 p2)

On a similar note, RJ said:

> We cannot be good in all subjects. Some are not really confident, you know. Even I feel like that. You know I used to be English teacher at Secondary school before I joined UBD. I am really out of touch with mathematics. But now I am teaching in primary school I have to teach it.
>
> (Q33 p6)

The teachers' lack of confidence and understanding of the mathematical concepts to be taught to the students should have serious implications for the students. One such implication might be that the students were deprived of learning those topics that teachers felt they were not confident to teach. This was cited by NA in the interview:

> If teachers are confused they cannot teach properly. That is why I don't dare to give the Area of a circle. I just leave it out.
>
> (Q16 p4)

Another implication might be that the students would not have the benefit of a variety of teaching methods that could help them to understand the mathematics concepts better.

ii) The teachers attributed their students' failures in mathematics to the students' lack of ability and skills, such as having a "short memory", "being forgetful", and "being poor in English language"

Teachers who took part in this study believed that there were certain conditions that should be met by the students themselves if they were to be good in mathematics. Some of these conditions were being hard working, being well-disciplined, and having a good memory.

In this section, we will notice that these teachers did not consider that their students possessed those conditions mentioned above, which, according to them, further inhibited their mathematics teaching. One of the teachers' attributes of their students was that their students were "forgetful" of what they had learned earlier. As a result, as mentioned by NA, teaching time was wasted because:

> Once we proceed to another topic, we have to remind them again (the last lessons), otherwise they will forget. So along the lesson we need to recall what they have learned. So I don't think...So hard to cover the scheme in a year.
>
> (Q19 p5)

Another attribution to the students' possible failure to learn mathematics is related to the Bilingual Educational policy in Brunei. According to this policy, students in Primary 4, 5 and 6 onwards have to learn mathematics and other examinable subjects through the medium of English. Before that, in Primary 1, 2 and 3, they will have learnt these subjects in Malay, the national language of Brunei. The teachers who took part in the study believed that a lack of understanding due to using the English language contributed to their students' poor performance in mathematics, especially in word problems. The above quote by NA echoes most of the teachers' concerns about their students' lack of understanding of the English language used to teach mathematics.

The language problem was mentioned again by the teachers when they were asked to comment about the mathematics textbook. For example, NA admitted that the textbooks, Active Mathematics, which was for students in Singapore was:

> ...not suitable for our students. The language, I think the language used is too high for our students, and they find it difficult to understand.
>
> (NA Q9 p3)

The severity of the students' lack of understanding of their mathematics due to using the English language is highlighted very well in the following extract from my interview with SAG. When she was asked if she had any problem teaching mathematics, she replied:

> I think I am okay, but for my students, this is the problem. They have to think and they have to read. You know, their English is poor. To understand what I say takes time for them to understand.
>
> (Q35 p6)

RA was saying that:

> ...they (the students) have to understand the language first before they can solve the problems.
>
> (Q35 p5)

The students' understanding of the language takes time to develop, and time is a rare commodity for these teachers who have to "rush to cover the scheme of work" (RT Q37 p5). Therefore, it seems that the teachers are inclined to resort to a simpler approach to overcome problems, such as using "key words" or "clues". This approach has already been explained in an earlier section of this chapter.

Another attribution is linked to the teachers' beliefs about school mathematics and mathematics teaching mentioned earlier. The teachers said that knowing the multiplication tables ("times tables" as it is known among the teachers in Brunei) preferably by rote, could improve students' performance in mathematics.

Because of the importance of the multiplication tables to the students' skills in doing their exercises, most of the teachers spent a considerable amount of time asking students to memorise the multiplication tables. For example, according to HM:

> ...we feel the problem is there, don't know their time tables. Then I try to solve the problem, I ask them to memorise, to drill all of them on tables. Sometimes I ask them to repeat the time tables over and over again.
>
> (Q2 p1)

iii) The teachers attributed their problems of teaching mathematics to the lack of support they received from the Curriculum officer, School inspectors and head teachers

The reason to include teachers' attributions about the lack of support as one of the factors that they believed inhibited or influenced their teaching practice was that these attributions emerged from the interview data, which revealed that teachers need support in mathematics teaching, particularly in instances where they are not confident in teaching the subject. Simon and Schifter (1991) in their study also emphasise the need for support, particularly for teachers who are struggling with the "emotional load of being novice" to new approaches and content. The following extract from an interview transcript of one of the teachers indicate this need:

> ...I think visits from the Inspectors and Curriculum officer is good. But it had to be done properly. I think it also help us to overcome our problems and also to help us to know if we have done any mistakes.
>
> (RJ Q29 p6)

Teachers in Brunei mentioned that they needed the support to help them get on with their mathematics teaching. One

particular area mentioned by the teachers was in-service training. Most of the teachers interviewed said that they had never attended any in-service courses for mathematics before simply because they were never told about any that had been offered or because they were not allowed to attend any in-service courses while they were teaching Primary 6 classes. But all of them wanted to attend such courses if they were given the chance to do so. The most common type of in-service courses needed by the teachers were those which:

> ...make mathematics teaching more interesting, or they can show us how to make simple, but good teaching aids.
>
> (ND Q24 p5)

and:

> ...the latest methodology...that will be much better. But make sure it suit our classroom.
>
> (JK Q24 p5)

The teachers also mentioned that they were observed by the Curriculum officer, School Inspectors and Head teachers but for reasons other than helping them to carry on with their work. Instead of gaining support from these authorities, the teachers said that they were the "victims" of these officers who "find faults" with their teaching. As mentioned by ASB:

> So they (the authorities) observed me. They are not encouraging me, but they only find faults. So I, not only me, but my other friends, we just keep quiet. We are afraid the

> comments might be bad. So possibly we will be sent to remote schools in the rural areas.
>
> (ASB O28 p8)

No feedback on any observations was ever given to the teachers, which was another complaint made by most of them in the interviews. The teachers said that they felt uneasy when they were observed particularly when they were not given feedback about the observations. According to RJ:

> I don't really mind if they come really to help me solve my problems. I don't like people who just visit you then didn't tell you what they were writing at the back. It make you feel uneasy.
>
> (Q28 p6)

The type of feedback that these teachers received was not only perceived by the teachers as inadequate or threatening, but also irrelevant and very weak. For example, the visit made by the Curriculum officer, according to one of the teachers was a; "part of her MEd dissertation" (SAG Q23 p5), and:

> ...to find out how far we have done the syllabus, what textbooks we are using, the area we are teaching...
>
> (NA Q23 p7)

While the Head teacher, according to RJ:

> ...was just passing by the class only. She checked our lesson plans once a week, but, no, she never came into the class while I was teaching.
>
> (RJ Q27 p6)

These teachers believed that none of the officers mentioned above really understood their problems or seemed to care what went on in the classrooms. As mentioned by SAG in one of her statement about the Curriculum planners:

> They don't know what our problems are. They just say, do this, do that. This school is very good, that school is not good. But, I don't think they know our problems.
>
> (SAG Q20 p4)

iv) The teachers attributed their lack of skills in teaching mathematics to their pre-service and in-service training

All the teachers in this study seemed to indicate in the interviews that the mathematics education courses, both pre-service and in-service, should be more prescriptive in nature, so that the teachers can just learn and transfer the content into the classroom, as mentioned by SAG:

> Methods of teaching, of course. If possible short cut, you know, how to teach so that pupils can understand quickly.
>
> (Q24 p4)

The perception the teachers had on their pre-service training had to do with the fact that the courses were "not realistic". According to RA: "the courses should be realistic, that we can use in the class" (Q24 p4). The term "realistic" used by the teachers did not indicate whether the pre-service and in-service mathematics courses they attended were not relevant to or ineffective in their situation. The teachers considered these courses were "not realistic" was because they felt the methods were too time-

consuming for the scheme of work they had to cover. For example, ND, admitted in the interview:

> Sometimes I remember what my lecturer said, sometimes I follow, I think it is good.
>
> (Q22 p4)

and on a similar note, NA said:

> ...the way my lecturer was teaching influenced me, if only I can use this method in the classroom...No time to do these activities in the classroom.
>
> (Q23 p6)

As I understand it, because of the pressures of the examination and completing the scheme of work in time, the teachers believed that the mathematics education courses they received were ineffective and that they needed the type of in-service and pre-service courses that would directly apply to the classroom. These I believe are the "realistic" courses they referred to in the interviews.

This became very clear when the teachers were asked about the type of in-service courses they needed. Most of them gave an answer similar to that of SAG quoted above:

> Yes, of course, I am willing to attend the in-service courses, but only if it helps me how to make my teaching easier, and how to cope with weak students.
>
> (NA Q24 p6)

> Still on method of teaching. If they have the latest methods, that will

be much better. But for sure it must suit our classroom. Like the one during SEACME 5 (South East Asian Conference of Mathematics Education) last year. I know the ideas were excellent, but can you really apply them in the classroom? I don't think so.

(JK Q24 p5)

Well, I really want to know how we can overcome our problem in teaching mathematics, really, you know, mathematics is the most problem subject. If only other people can tell us how to overcome shortage of time, to finish the syllabus, we will be happy.

(RJ Q24 p5)

v) The teachers attributed their problems of teaching mathematics to: (a) teaching materials such as textbooks and workbooks and (b) curriculum resources, such as the syllabus and the scheme of work used to teach mathematics

The underlying assumption to include the teachers attributions about the curriculum resources and materials among the factors that teachers believed inhibited and influenced their teaching practice was that these resources could serve as the main influence on the teachers' practice, particularly in developing countries where there is evidence to suggest that, in school, factors such as textbooks or writing materials exercised more influence on achievement in the Third world than they did in the industrialised countries (Fuller, 1987). Sarason (1982) is also quoted as saying that the quantity and quality of resources helped to determine the extent to which teachers can achieve their teaching goals. The following sub-sections will highlight the teachers perceptions of these resources.

a) The problems relating to the availability and relevance of textbooks, workbooks and teaching aids in primary schools in Brunei as perceived by the teachers

The teachers interviewed agreed that the provisions of textbooks and workbooks were sufficient in primary schools in Brunei. The main criticisms teachers had concerning these materials were that the textbooks were, as already mentioned in Section 1 of this chapter, too difficult and not relevant for primary schools students in Brunei in terms of the content and the language used.

The mathematics textbooks used in Brunei, the "Active Mathematics" series, were actually meant for students in Singapore primary schools. The Brunei Ministry of Education adapted them for use in Brunei primary schools because the Curriculum Development Department in Brunei could not produce more suitable textbooks. This was probably because of a lack of manpower and expertise and also, since Brunei is a small country, the market size is small. Therefore, it was not considered to be cost-effective for Brunei to produce her own textbooks. Another disturbing fact about these textbooks is that they had been considered obsolete in Singapore since early 1980s. Therefore, it was not surprising when the teachers said that the textbooks were difficult and not relevant to Brunei students, and also the content was not arranged according to the scheme of work.

To supplement them, the Curriculum Development Department in Brunei, however, prepared workbooks containing more exercises for the students.

As mentioned earlier, the teachers believed in "doing

exercises" in preparation for the examination as the main focus of their mathematics teaching. Therefore, the teachers complaints about the textbooks were also related to the exercises they contained. The teachers perceived that the exercises were:

> ...not really relevant, not in line with the syllabus, even with the examination questions. You see, so far different from the workbook.
>
> (NA Q10 p3)

Regarding the other teaching aids such as shapes, weight etc., the teachers admitted that these were available in the schools, but that their use was not widespread in the primary schools in Brunei.

b) The problems relating to the curriculum and scheme of work in Brunei

Basically, these teachers did not comment on the mathematics curriculum content nor that it might be inappropriate to Brunei students. Afterall, according to 6 out of 12 teachers, they had never seen the official mathematics curriculum prepared by the Curriculum Development Department.

The document they used as the guideline in the classroom was the "scheme of work". According to the teachers, it was translated from the mathematics syllabus by the members of the Association of the Head teachers. All 12 teachers interviewed admitted that they were given the Scheme of Work, the "practical mathematics curriculum" as the guideline for the topics they have to teach in the classrooms.

The teachers complained that the Scheme of Work was "too rigid" (ASB Q16 p5) and too structured. For example, the scheme:

> ...only tell us when the lesson has to be done, topics and subtopics and pages from the textbook where the exercises are to be used..."
>
> (RJ Q16 p4)

All the teachers knew that they were required to follow the scheme of work very closely because, otherwise, according to RJ. "...it is at your own risk" (Q16 p4). The scheme of work was also "centralised. Every school in the State have to do the same." (RT Q16 p6)

Another inhibiting factor relating to the scheme of work according to the teachers was that it had too many topics and subtopics. The teachers found that it was difficult to cover all the topics in time for the examination. According to NA:

> We have 5 hours per week for mathematics. Even that is not enough because the topics are too many and (which) we have to finish within a year, even less than a year. I think the number of topics should be reduced.
>
> (Q19 p5)

The teachers were also anxious that if they did not cover those topics, according to RJ:

> ...it is at your own risk, because, like it or not, I have to rush to keep up, or my pupils will be left

behind. So difficult, I sometimes don't know what to do.

(Q16 p4)

Using the interview transcripts, the teachers "coping strategies" used to address these problems will be highlighted in Section 3 of this chapter. As already mentioned, Section 3 was not planned as a part of the study (Ref., Phase 1 - aim), but had surfaced in the analysis.

SUMMARY OF SECTION 2

The attributions mentioned by the teachers in Section 2 seem to make sense if their beliefs about school mathematics, mathematics teaching and the examination mentioned in Section 1 are to be taken into consideration. For example, because of the teachers' beliefs about the important role of the examination and their beliefs about the type of examination we have in Brunei, the factors that they believed inhibited their teaching were attributed to those which could handicap their efforts to provide their students with the necessary skills for "doing the exercises". The teachers had unelaborated ideas about mathematics teaching and learning. So far, the analysis seems to have suggested that these teachers knew that mathematics is a very important subject in the school curriculum, together with the other subjects, which all students have to pass in the examination in order to proceed to the next stage of their education. However, mathematics is unique compared to other subjects in the sense that most teachers in this study find it a difficult subject to teach.

Most of the teachers in this study admitted that they were

not good in mathematics and not confident in teaching the subject. Mathematics is taught in English, but unfortunately students were not good in English. It was therefore not surprising that the teachers needed a prescriptive type of training in teaching mathematics in both pre-service and in-service education. Because of their limited understanding the English language, numbers are only symbols that make sense to the students in a mathematics lesson. Since both the teachers and the students put a strong emphasis on the examination, the only means of communication the teachers and the students had in the classroom was through the manipulation of these numbers. Therefore, the teachers would appreciate suggestions of ways to enable students to memorise the multiplication tables, the workbooks and textbooks containing exercises that are relevant to the types of questions asked in the examination and a reduction in the number of topics in the scheme of work. Since these conditions were not available, the teachers would obviously look for methods to make their teaching more bearable, most of which have been mentioned in Section 1 and Section 2 of this Chapter and will be discussed again briefly in the next section.

3.4 SECTION 3: METHODS THAT TEACHERS SAID THEY USED TO COPE WITH THE FACTORS THAT THEY BELIEVED INHIBITED THEIR MATHEMATICS TEACHING

Teachers in their work identify certain knowledge as a strategy appropriate to every learning situation. According to Spradley (1980), this knowledge is their culture and consists of the "acquired knowledge people use to interpret experiences and generate social behaviour". Their culture of teaching is embedded in what works well for them, as pointed out by Pollard (1982):

> ...teacher culture acts as a means of protecting teachers from the difficulties of their role in many ways.
>
> (p 25)

I believed that this knowledge does not constitute the technical culture of teaching, but typifies teaching as an occupation, which Hammersley (1980) refers to as "typifications of situations and lines of actions". This acts as a means of protecting teachers from the difficulties of their roles as mathematics teachers teaching under various demanding conditions.

In this analysis, I began to realise that obtaining good results in the examination was a very important, if not the only, goal of teaching and learning mathematics according to these teachers. To achieve good results, the teachers would try various methods to make their teaching successful. The teachers inevitably blamed certain factors which they perceived to be responsible for the difficulties of obtaining the smooth running of mathematics teaching, such as the scheme of work, which they believed contained too many topics and sub-topics to cover, the textbooks and workbooks which were both too difficult for the students and irrelevant to the examination and other factors mentioned earlier in Section 2. These teachers seemed to believe that if steps were taken such as to lessen the number of topics in the scheme of work and provide the teachers with textbooks and workbooks more relevant to the examination, the results of the students' mathematics examination performance in Brunei would improve.

When the above constraints and practicalities became clear to the teachers, they seemed to have demonstrated their

reasons for moving away from the ideal to the pragmatic approach of teaching. The teachers perceived that mathematics teaching should be conducted in response to the conditions they felt inhibited their teaching in the classroom. For example, the teachers perceived their students could not understand the English used in the word problems and therefore decided to teach the students to identify "key words" or "clues" in the questions.

There might be some confusion about the factors that really affect the teachers' teaching of mathematics. But what was unfortunate in this situation was that the teachers' beliefs about school mathematics and mathematics teaching inevitably affected the students. For example, there were no attempts to teach the students to understand the mathematical concepts embedded in the mathematics questions and the students were not encouraged to develop higher level thinking in mathematics as they were "rushed" through the scheme of work. The tendency on the part of the teachers proved to be to teach a large number of topics but to teach none of them well which eventually handicapped the students from understanding mathematical concepts and, in turn, did not improve the state of mathematics education in Brunei.

The teachers also set up certain rules and procedures that were central to effective mathematics teaching in the classroom. These rules and procedures applied only to their students. For example, these teachers believed that discipline was a very important factor in mathematics learning. Using discipline involved the students making more effort in the classroom. This included their memorising their multiplication tables and doing a lot of practice in the four basic operations. Furthermore the

students were not allowed to get help in doing their classwork or homework from their friends or parents. For example, the teachers did not let the students be seated in groups when they were doing exercises, for fear that "they copy from their friends" (ASB Q11 p4). The students were also required to keep quiet in the classroom, especially when they were doing their classwork. These measures seem to suggest that the teachers believed mathematics to be a "mental discipline".

The roles of the students was very clear as far as the teachers were concerned. They believed that the students must be diligent, hard-working, always check their books when they were at home, and practice doing the mathematics exercises with constant drilling if they were to get "good" results in mathematics examination. These roles were readily accepted by the students and probably by their parents and the school authorities, as mentioned by one of the teachers; "...these students, if they get high marks in the exercises they love it." (RJ Q2 p1). This was because students' entrance to Secondary school was viewed as exceedingly important by the teachers, the students, their parents and the school administration.

3.5 CONCLUSION

Perhaps the essence of this study was the marked similarity of beliefs and perceptions associated with the school mathematics, mathematics teaching and examination held by all the teachers who took part in the study. For example, 10 out of 12 teachers mentioned that mathematics consists only of numbers that require the four operations. 8 out of 12 teachers said that mathematics is a subject where doing

exercises is predominant. Although the ways that the teachers expressed their beliefs were different, in essence their beliefs were similar. This homogeneity should suggests that the teachers formed these beliefs through the interaction of similar phenomena which make up the unique culture of mathematics primary teachers and teaching in Brunei. Such phenomena could be the System of Education, the teaching and learning culture of the society in Brunei, classroom environments, teachers' personal experiences, teachers' pre-service and in-service training, and the students' motivation in learning mathematics. This study has so far suggested that the phenomena mentioned above had a strong influence on the teachers' choice of teaching methods. In the interviews, I had the notion that the teachers had already pre-conceived, deep-seated beliefs about the type of mathematics teaching they were going to conduct in the classroom. Whatever they said in the interview regarding their beliefs about school mathematics, about mathematics teaching and the examination system, was based around these teaching strategies because these they believed, had "worked" for them and their teachers before them in the past.

In the interviews, it was obvious that the teachers mathematics lessons tended to be teacher-controlled. The teachers played a predominant role in the class while students were required to be passive learners. This could be because the teachers were not confident of teaching mathematics; therefore they felt more comfortable using the methods of teaching mentioned earlier. These methods would not provide any chance for the students to challenge the teachers since the former were encouraged to be passive in the classroom. The students knew that they themselves would be responsible for themselves if they failed in the

examination and would think that they had not worked hard enough to earn good grades. From the interviews the majority of the teachers came across as wary of sharing their decision-making powers and authority with the students. Thus the students were required to be passive, and good listeners in the classroom. The above scenarios may suggest, once again, that the teachers' preparation and the culture of teaching and learning in Brunei might play an important part in influencing this teaching and learning behaviour. This issue will be discussed in the last part of this thesis.

There is no reason to find a simple relationship between the beliefs that have been highlighted in this study, nor is it easy to identify the influences on these teachers' beliefs about their teaching practice. As shown in this Chapter, various factors may affect the teachers' teaching, starting with the teachers' beliefs about school mathematics, the teachers' lack of mathematical knowledge and their inconfidence in teaching.

The next phase of the study will concentrate more on mathematics teaching in the actual classroom. The focus will be on the teachers, particularly on observing their behaviours in the classroom. The underlying assumption is that beliefs should be translated into classroom practice before they are properly articulated and understood. However precisely the teachers interpreted their beliefs during the interviews, these beliefs were not articulated until then. Deford (1985) mentioned that:

> ...The extent to which teachers' behaviours are influenced by their theoretical orientations has been difficult to demonstrate.
>
> (P 351)

In the Phase 1 study, it was found that teachers' beliefs about mathematics teaching are influenced by a variety factors. Phase 2 was aimed to see how the teachers translate their beliefs to their classroom behaviours, and see if there are inconsistencies of behaviour among the teachers who took part in the Phase 1 study.

CHAPTER 4

PHASE 2: THE INTERVIEWS AND THE CLASSROOM OBSERVATIONS

4.1 Introduction

The data collected in phase 1 have provided me with an understanding of some of the beliefs associated with school mathematics teaching held by the teachers took part in the study. The analysis also highlighted the teaching conditions and pressures the teachers encountered relating to mathematics teaching in the classrooms in Brunei Darussalam. Many of the teachers' critiques resulted from an understanding of a very obvious problems of centralisation. The obligation of the teachers to follow the scheme of work closely because of the centralised examination system was one of their main sources of complaint in Phase 1 of the study.

The teachers believed that the centralised examination system and the System of Education in Brunei Darussalam restricted their choice of teaching methods. These restrictions were associated with other problems: i.e. that the teachers had to rush to cover the scheme of work, the students' poor understanding of English language which prompted the teachers to use 'key words' and 'clues'. There were also reasons for believing that the restrictions might be imposed because of the teachers' lack of confidence in teaching mathematics. What was evident from the interviews in Phase 1 was that these "pressures" did not give the teachers a feeling of "despair" since the present method of assessment in Brunei is acceptable to them. rather, they tend to find ways of working within the constraints.

It was to be anticipated that teachers made individual choices in what they did in the classroom. For example, Shavelson and Stern (1981) proposed a model based on the assumption that teachers' interactive teaching may be characterised by carrying out well-established routines. It is a presumption shared by most educators that teaching makes a difference in the classroom. I also believe that to be the case. What I do not believe to be the case is that we are in any position to prescribe useful general rules about how teachers should proceed in order to achieve various aims in the classroom.

Teachers know the social structure of the school in which they work and what it requires of them and their students for survival and for success; they know the community of which the school is part, and have a sense of what it will and will not tolerate (Elbaz, 1983 P5). Broadfoot et al. (1988) in a comparative study of 360 French and 360 English teachers argue "that the national context in which teachers work deeply influences their professional ideology, their perceptions of their professional responsibility and the way which they carry out their day to day work" (P 265). Brunei Darussalam teachers. like teachers in France, work within a tradition of centralised control and defined contractual obligation. Taking into account these conditions and problems, the teachers' approach to teaching mathematics in the classroom seems rational and justifiable. The teachers' reports seem to suggest that their perceptions of the realities and the context of the classroom teaching are to a marked extent linked to their behaviours.

Nonetheless, teachers seemed to hold their own idiosyncratic beliefs. According to some researchers,

beliefs are believed to be the best indicators of decisions individuals make throughout their lives (eg. Bandura, 1986). Teachers and their beliefs may still play a major role in mathematics teaching and learning since they lead to actions and these actions impact on students (Clark and Peterson, 1985).

The teacher's world of specific teaching of mathematics was designed for his/her real, known and, at the same time, unique students in a similarly unique classroom. At the same time teachers' instructional decisions, judgements and eventually their classroom teaching could be mediated by their beliefs. Very few would argue this (Ashton, 1990; Nespor; 1987; Feiman-Nemser & Floden, 1986). This point is also expressed by Clark and Peterson (1986) as follows:

> ...a teacher's cognitive and other behaviours are guided by and make sense in relation to personally held systems of beliefs.
>
> (P 207)

In Phase 1 of this study, the focus was specifically on highlighting the teachers' beliefs about school mathematics and mathematics teaching and the factors that they believed inhibit or promote their mathematics teaching in the classroom. Phase 2 focuses on the relationship between those beliefs and the actual practice. To begin with, in the next section, I will attempt to provide a brief review of the studies that have been done by some researchers in similar areas of concern. I have to draw the readers attention that the studies that I reviewed in the following section are mostly studies on Secondary or Junior High teachers. Another possible contribution of my study is to add to the knowledge about beliefs and practices of primary

mathematics teachers, which, throughout my study, I have searched and found very few that have been done on it before.

4.2 Previous research relating to Teachers' beliefs about mathematics, their beliefs about mathematics teaching and their relationship to instructional practices

Many researchers in the past have concentrated on teachers' perceptions of mathematics and pedagogy and their effects. Four of these researchers (Thompson, 1982; McGalliard, 1983; Kesler 1985 and Lerman, 1986) who are similar in their focus of studies but operate from somewhat different vantage points will be discussed briefly. All of them focused upon the potential usefulness of a conceptual systems theory to understand teachers' practice. In their studies these authors used the terms ***conceptions, attitudes, perceptions,*** and ***views*** interchangeably with beliefs (Thompson, 1982; McGalliard, 1983; Kesler, 1985 and Lerman, 1986) The terms were defined by one of these authors as:

> ...the set of beliefs and the set of disbeliefs held by the teachers about mathematics and its teaching...(as well as) concepts formed about the subject matter and its teaching.
>
> (Thompson, 1982 P 12)

A study carried out by Thompson (1982) in the United States of America, drew specific attention to the role that pedagogy might play in teachers' conceptions of mathematics but he argued that this had "largely been ignored" (P 105) in the literature. This study involved three junior high school mathematics teachers. The three teachers, Kay,

Jeanne and Lynn were observed while teaching their classes over a period of four weeks. During the last weeks, they were interviewed after each observed lesson in order to clarify specific events of the day's lesson. The teachers' conceptions of mathematics were also assessed in term of bi-polar dimensions that may be used to describe the subject. The three case studies are illustrative of the teachers' variety of views about mathematics, both in terms of comprehensiveness and integratedness, yet with some points in common (For example, all the teachers focused on the logical aspect of mathematics). Kay, for example, saw mathematics as a process: ideas and mental processes rather than facts; as notation and proof; expanding; as a formal discipline and its application, although this was not in a specific sense. Kay held a problem-solving view of mathematics. She viewed her mathematics teaching as consisting of questions, creating and maintaining an open and informal classroom, being receptive, encouraging; guessing and conjecturing, appealing to intuition and experience, probing for misconceptions and using a variety of approaches.

Jeanne did not express her views about mathematics during the study but her "marked tendency to stress the meaning of concepts taught" (Thompson, 1984) during her teaching reflected her view of mathematics as a coherent collection of interrelated concepts and procedures; consistent, free from ambiguity and arbitrariness. For Jeanne this was the mathematics of the school curriculum; narrow in scope; mysterious; accurate, precise, logical and practical. Jeanne's views of mathematics in that teaching stresses a meaningful relationship and logic; formal structural properties; order, respect and courtesy in the classroom;

control of all instructional activities; not intuitive or practical; an attempt to adjust to learners' needs.

Lynn, however, expressed rather inconsistent views. Her teaching "reflected a view of mathematics as prescriptive in nature and consisting of static collection of facts, methods and rules..." (Thompson, 1984 P116). She viewed mathematics as prescriptive: consisting of static facts, procedures and rules. She also viewed mathematics as exact, cut and dried, predictable, absolute, fixed: focusing on logical reasoning with few opportunities for creative work. Lynn viewed mathematics teaching as consisting of transferring information, demonstrating, responding to questions, providing lots of practice; she sought to relate mathematics to real life and focused on a positive student-teacher relationship.

Thompson's study highlights the differences in the teachers' conception of mathematics and its teaching. The study also provides qualitative evidence of the relationship between the teachers' conceptions of mathematics and their conceptions of mathematics teaching. However, the relationship between teachers' conceptions of mathematics and mathematics teaching and their instructional behaviour seemed to be a weak one. Thompson found that "teachers' conceptions are not related in a simple way to their instructional decisions and behaviours." (P124). She points out a key factor that teachers' beliefs about mathematics teaching were not subject specific, Moreover, she suggests that the relationship might be stronger in cases in which teachers tended to reflect upon their practices in the classroom.

Another study carried out in the United States by McGalliard (1983) investigated the conceptions of

geometrical knowledge communicated through instruction, the aims of teaching geometry, and evaluative assessment of the students of four High school mathematics teachers. Extensive observations were made on the teachers in their classrooms for a period of three weeks. For additional data, McGalliard used initial interviews, stimulated recall interviews to be conducted in connection with audio tapes of the teachers' lessons, and written responses to a set of questions focusing on different aspects of teaching geometry obtained subsequent to the observation period. These data were used to form a profile of each teacher's conceptualisation of factors of interest in the study.

The major findings of McGalliard's study were that the four teachers communicated, through instruction, similar conceptions of geometrical knowledge. The teachers also held similar conceptions about the aims of teaching geometry. The two aims of teaching geometry identified from the four teachers were; first, geometry affects students thinking. Three of these teachers believed that geometry would have impact on students' general thinking, while one of the teachers believed that geometry would promote mathematical thinking only. A second aim indicated by the teachers was the teachers' "desire to ensure a smooth running school system", such as to complete the syllabus. Interestingly, the teachers differed greatly in their measurements of their pupils. These assessments "ranged from negative attributions and expectations to unquestioning positive attributions and expectations", thus suggesting that these differences are influenced by factors other than the subject matter.

Kesler (1985), also carried out his study in the United States of America, where he investigated four high school

mathematics teachers' conceptions of mathematics and mathematics teaching, and the relationship between these conceptions and their instructional behaviours. Kesler's study aimed at examining the influence of teachers' levels of dogmatism (with the emphasis on the role of authority) on their practices. Case studies of the four teachers were conducted over a period of five weeks. Kesler used a variety of data-gathering techniques including participant observations, audiotaping of the class sessions, stimulated recall interviews, the Rocheach Dogmatism scale, and a "Conception of Mathematics Inventory" especially developed for the purpose of the study. In his study, Kesler did not focus on the aims of teaching mathematics but he examined teachers' conceptions of pupils' understanding of mathematics and the role of textbooks in teaching. He also provided some information about the setting of the teachers' schools and of the classroom climates.

Kesler reported some variability in the degree of consistency between teachers' conceptions of mathematics and their teaching practices. The findings of the study were that conceptions of mathematics differed among the teachers, ranging from a dualistic conception to multiplistic/relativistic conceptions. The findings of the study also supported Kesler's original assumption that teachers' conceptions of mathematics and mathematics teaching influenced the way they teach the subject. However, the teachers' levels of dogmatism, which ranged from "strict authoritarian to an inquiry mode of instruction", did not appear to play a significant role in affecting their practices.

In England, a study was carried out by Lerman (1986) on nine mathematics school teachers in Secondary school. This

involved sixteen classes and a total of eighty mathematics lessons. This study attempted to present further evidence in favour of the existence of a relationship between teachers' views about mathematics, their views about mathematics teaching and their instructional practices. The research instrument used in this study was a mixture of questionnaires and classroom observation. The teachers' answers to the questionnaires were further complemented by means of short interviews. In order to assess the teacher's teaching, they were observed by the researcher on several occasion with different classes. As a tool for lesson observation Lerman made use of a system of recording, involving nine categories of pupil-teacher interaction.

In order to assess teachers' views of the nature of mathematics and mathematics education, Lerman (1986) developed a Likert-type attitude questionnaire which incorporated statements about mathematics and mathematics education reflecting either an absolutist or fallibilist perspectives. Lerman's work draws heavily on alternative philosophical views of mathematics. He identified four of these perspectives namely: Logicism, Formalism, Intuitionism and Lakatosian. He argues that it is possible to arrange teachers' views and actions along a single continuum whose extremes are at the one end Lakatosian or fallibilist and at the other Euclidean or absolutist.

According to Lerman, the absolutist or Euclidean perspective considers mathematics as "based on indubitable, value-free, universal foundation". The contrasting perspective, the Lakatosian and Fallibilist, considers mathematics as a "social invention, its truths and concepts being relative to time and place." Lerman (1983) suggested that "choice of syllabus content, teaching style and

students' attitudes towards mathematics are all determined by the philosophical choice a teacher makes "even if scarcely coherent" (P 62). Associated with the absolutist perspective of mathematics would be the teacher as "the processor of knowledge" (P 62), whereas the Fallibilist view of mathematics would be mirrored in class through the active participation of pupils "involved in the process of doing mathematics" (P 62)

Despite the presence of a wide diversity of views about mathematics and mathematics education as expressed by the teachers' answers to the questionnaires and interviews, Lerman found a considerable uniformity in their practices in the classroom. He identified the social context of the school as a strong determinant of the teachers' practices. Lerman went on to say:

> ...a strong candidate for explanation of this uniformity may be that the ethos of the school and the particular mathematics department may be the most significant factors in determining the way the teacher teach.
>
> (1986, P128)

In more recent studies on teachers' beliefs and their relationship with the teachers' instructional practices, most of the studies were based on interviews only; few studies involved classroom observations. Though, one such study was conducted by Grouws et al (1990). The study involved 25 junior high teachers from 8 schools in a large midwestern school district. Between them, these teachers taught more than 2500 students in 119 classes.

In this study, the teachers were interviewed for 50-55

minutes, to determine their conceptions about problem solving and its instruction. The findings suggested that teachers' had formed varied definitions of problem solving. In some instances, the relationships were clear, for example, teachers who believed that problem-solving means word problem used problems mostly found in textbooks for their problem-solving lessons. Other aspects of the problem solving instructions "were heavily influenced by external factors such as textbooks, district expectations, and standardised testing..." (P 135)

The inconsistency of teachers' beliefs and their practices is also manifested in the findings of the study conducted by Sosnaik, Ethington and Varelas (1991) who used that data from the Second International Mathematics Study to explore teacher beliefs. They found that:

> ...eighth-grade mathematics teachers in the US apparently teach their subject matter without a theoretically coherent point of view. They hold positions about the aims of instruction in mathematics, the role of the teacher, the nature of the subject matter itself which would seem to be logically incompatible.
>
> (P 127)

The goal of the research was to determine whether consistent patterns of teacher actions resulted in different instructional outcomes. Their initial task was to identify eighth-grade mathematics teachers in the US having consistent curricular orientations. However, they found that these teachers have no coherent perspective of teaching and many of them hold inconsistent views. The results of this study raise interesting and profound

questions about the nature of mathematics teaching in the US and teachers' goals for instruction.

The above studies suggest that teachers' beliefs about mathematics and its teaching can play an important role in their practice, and that there are consistencies in the teachers' beliefs about mathematics and their beliefs about mathematics teaching. However, these studies also showed, as in a study related by Lerman (1986), that there is no clear relationship between beliefs and teachers' instructional practices in the classroom.

There are several reasons as already mentioned, for the inconsistencies between teachers' beliefs and their practices. As already suggested, the beliefs-behaviour relationship is enormously difficult to study and research. Another factor raised by some of the above authors (e.g., Thompson 1984) is that of the existence of contradictory view about the nature of mathematics held by the teachers. Thompson observed the discrepancies by stating:

> Although the complexity of the relationship between conceptions and practice defies the simplicity of cause and effect, much of the contrast in the teachers' instructional emphases may be explained by the differences in their prevailing views of mathematics.
>
> (1984, P 291)

One may wonder whether the teachers' apparent ambivalence emerge from two distinct but related objects, namely, mathematics and school mathematics. Teachers have experiences with mathematics during their lives which

result from two quite different situations: as learners and as mathematics teachers. Beliefs and attitudes about teaching and learning are derived largely from past classroom experiences, either in the role of teacher or in the previous role of learner (Goldsmith and Nelson, 1991). It may be that as a result of those experiences an integrated view of mathematics has emerged, but it is also possible that they have led to two separate unrelated views. It seemed useful to consider two forms of mathematics; one as an academic discipline and the other as a school subject, and assess teachers' views about them.

Finally, though the studies by the researchers reviewed above have not especially concerned with the factors with may explain the teachers' beliefs as such, they, in fact, attempt to resolve some of the noted discrepancies by indicating some variables which might account for them. For example, a study by Lerman (1986) considered that 'specific school context' is a strong determinant of mathematics teachers' instructional practices. Thompson (1982), similarly emphasises the role of personal factors and, in particular, the teachers' level of reflectiveness as a major factor in explaining the gap between their conceptions of mathematics and mathematics teaching and their actions in the classroom.

Teachers have to make decisions when they are teaching and interacting with their students in the classroom. Thompson (1992, P 139) seemed to support this statement when she said that:

> ...by interacting with their environment, with all its demands and problems, teachers appear to evaluate and reorganise their beliefs through reflective acts, some more than others.

In Phase 1 of my study, the teachers' beliefs about school mathematics and mathematics teaching were highlighted. The natural progression from that of understanding the teachers' beliefs should be followed on by trying to see how these beliefs are being translated in the classroom, that is, how these beliefs influence the teachers' behaviour in the classroom. It was for this reason that, Phase 2, four of the teachers who took part in Phase 1 study (see criteria for selection in Chapter 2) were interviewed and observed teaching mathematics in their classroom for a total of 12 weeks.

Before I began to put together the case study for each of the four teachers, I should like to emphasise in advance, (although already mentioned in Chapter 2) the difficulty of interpreting the observation data 'objectively'. I see this as an important methodological issue. As an observer, it was not easy for me to be completely detached when in the classrooms. As an observer, I was bound to develop some feelings about the place, the people and the events observed since the teachers and the schools were very familiar to me. In my case, it cannot be denied that in all the classrooms I observed, I noticed warmth and camaraderie in the teacher-pupil and pupil-pupil interaction. I developed a sense of admiration for the business-like, matter-of-fact way in which the teachers handled their classrooms of thirty to thirty-five children. These, then are some of the feelings I had to keep at bay as I attempted to interpret the observation data objectively.

4.3 THE ANALYSIS AND INTERPRETATIONS OF PHASE 2 STUDY

4.3.1 The categories to be included in the interpretations

The categories to be included in the analysis are derived from two sources, namely: the aim of my study for Phase 2, which is to highlight the relationship between the teachers' beliefs and their teaching practice and also the classroom observation notes and the interview transcripts. For example, to highlight the teachers' teaching practices, the categories generated by the data from the classroom observations have been used to classify issues relating to the teachers' teaching in the classrooms, such as teachers' attempts to achieve their teaching goals and so on. Similarly, some categories were generated from the interviews while the analysis was being conducted: for example, teachers' attributions of their students' abilities and the teachers' assessment of their own skills and ability in school mathematics and mathematics teaching. These categories were to be used in the case studies to follow.

4.3.2 SECTION A: Data generated directly from the classroom observations

i) Teachers' attempts to achieve their teaching goals

Although teaching goals are not observable from the classroom observation, the underlying intention to include teachers' attempts to achieve the goals in the analysis in this section was because goals are important to understand what was going on in the classroom. This was an impression I got from the Phase 1 study, where the majority of the teachers' goals were instrumentally initiated. The teachers' teaching goals for the Phase 2 study were generated from the interviews with the teachers before the classroom observations. In some circumstances, teachers' goals were also inferred from my observations of their classroom behaviour. The teachers' teaching behaviour

relating to their teaching goals which I wanted to observe were driven by the following questions: What did the teacher do to achieve his/her goals? Was he/she permitted to achieve his/her goals? To what extent the teacher strived to achieve his/her goals?

ii) Teachers' teaching practices - The teaching strategies that teachers used in the classroom

One of the aims of the Phase 2 study was to find out the consistencies between those teachers' beliefs mentioned by them in Phase 1 and teaching practice in Phase 2. Therefore, the purpose of including this category was to highlight the teachers' methods of teaching mathematics as used in the classroom. In addition, this section also attempts to highlight the teachers' classroom organisation, choice of teaching materials, and the methods the teachers used to evaluate their mathematics teaching and the students' learning.

iii) The teachers' relationship with their students

One of the main reasons for highlighting the relationship between the teachers' beliefs and their classroom practice should be to investigate the teachers' relationships with their students in the classrooms. This was considered important because such a relationship could determined the success or failure of the students' learning of mathematics. Therefore, in this section, using my observation notes, an attempt was made to highlight the teachers' relationships with their students while they were teaching mathematics in the classroom.

4.3.3 SECTION B: Data generated from the interview transcripts to highlight the teachers beliefs and attributions

i) The teachers' assessment of their own ability and skills in school mathematics and mathematics teaching

To begin the analysis of the interview transcripts, the focus was on the teachers' assessment of their own ability and skills. This was considered to be important for explaining some of the teachers' teaching behaviours in the classrooms. My assumption was that the teachers who were not very well verse with the content of the mathematics that they were transmitting to their students would not be confident in imparting that knowledge to their students. Their lack of confidence should be obvious from my observation of the way they teach mathematics. For example, an unconfident teacher might not be promoting learning through the use of teaching aids and activity methods if high level mathematics is required for this type of teaching. They would stick to teaching methods which were very familiar to them, especially the ones that they experienced when they were students.

ii) The teachers' attributions of the students' ability and motivation to learn mathematics

The aim of this part of the analysis was to look at the factors to which the teachers attributed the success or failure of their students and the teachers' assessments of their students' learning, such as what motivates the students to learn mathematics and what factors inhibited their learning. These attributions would be related to the teachers' methods of teaching.

iii) The teachers' beliefs about school mathematics and mathematics teaching

The aim of this section is to highlight the teachers' beliefs about school mathematics and mathematics teaching that had surfaced in the analysis of the interview transcripts and from the teachers' behaviours referred to in the observation notes. Although the teachers' beliefs about school mathematics and mathematics teaching have been highlighted in Phase 1, the opportunity to refer to them again in Phase 2 would give further insights into the teachers' beliefs which could be used for discussion about the relationship of these beliefs to the teachers' teaching practice in the classroom.

In the following Chapter, the findings of Phase 2 study will be highlighted in the form of case studies for individual teachers took part in the study.

CHAPTER 5

THE CASE STUDIES

5.1 CASE STUDY 1: Teacher ND

5.2 SECTION A: The teacher's profile

ND was in her early thirties and had been teaching in primary schools for the past 6 years. She had graduated from the Sultan Hassanal Bolkiah Institute of Education, in Brunei Darussalam with the Certificate of education in 1987, after attending a three-year teacher training course. In 1992, ND took part in the Phase 1 study, and she was teaching Primary 5. In 1993, ND was teaching the same students in Primary 6, when she took part in the Phase 2 study.

The school where ND was teaching was a big primary school approximately 50 Kilometres from the State Capital of Bandar Seri Begawan. There were about four hundreds students and 20 teachers in the schools, the classes ranging from pre-school (5 years old) to primary 6 (12 years old). ND's classroom was on the first floor of the two-storey school building.

The classroom was very clean, with posters and charts mostly made by the teacher put up on the wall behind the classroom. The posters and the charts were mostly about science and mathematics topics, such as theorems, formulae and also some examples of how to solve certain types of problems. The classroom was rather small for 32 students. The sitting arrangement was in rows, with the girls sitting at the front and the boys at the back. At the

front of the classroom was the teacher's table and a blackboard. No other teaching aids were visible in the classroom.

ND is a very pleasant teacher, always well-dressed in her "baju kurung" (Malay dress) and a head scarf. Her Headteacher spoke highly of ND when she spoke to me the first time I visited the school. According to the Headteacher, ND always represented her for functions in other schools, and she was in-charge of the English language Project in the school.

I usually interviewed ND in the staffroom before her mathematics lessons started. If her mathematics period was first thing in the morning, then we would go to her classroom as soon as the mathematics period started. The students would always greet the teacher as she entered the classroom with "good morning" and "Assalamulaikum" (Peace by with you)" Then followed the other formalities such as morning prayer and marking of the register.

5.3 SECTION B: Data generated mainly from the observation notes to highlight ND's teaching practice in the classroom

i) The teacher's attempt to achieve her teaching goals

To provide the basis for understanding the teacher's teaching practice in the classroom, it seemed essential to start the analysis by specifying the teacher's teaching objectives and her attempts to achieved these objectives in the classroom, as well as the evaluative criteria that ND used to assess her teaching.

ND's objectives in teaching mathematics were specified in terms of the outcome of her students' learning. For example, during one interview, ND stated that the objectives of her mathematics teaching:

> I want them (the student) to be able to answer all the questions given to them. If more than three-quarters can do most of these questions I think I will have achieved my objective.
>
> (ND 7/9/93 B)

In the next section, the teacher's teaching methods that she used to teach mathematics in the actual classroom are highlighted and discussed.

ii) ND's teaching practice: The teaching strategies that she used in the mathematics classroom

During the two weeks I observed ND teaching mathematics in her Primary 6 classroom, I noticed that her teaching was reflecting her attempts to achieve her teaching objectives mentioned earlier. It must also be remembered that her students had only a month to study before the PCE examination in October. In one of the interviews, she described the teaching method she used:

> Nothing much. Just writing down the questions on the blackboard. Just polishing their skills in answering questions.
>
> (ND 31/8/93 B)

The urgency to make her students pass the PCE examination at the end of the year was clearly reflected both in the interview and in her teaching. Throughout the two weeks of

observation, I noticed that there were no specific mathematics topics taught but an accumulation of topics for each mathematics lesson for revision. Therefore, a month before the PCE examination, these Primary 6 students had already started doing revision work. This was confirmed by ND:

> ...by August the syllabus has to be finished, and starting September we have to start doing revisions.
>
> (ND 31/8/93 B)

The lesson always started with the teacher asking the students if there were questions supposed to have been answered in the previous lessons that they still did not understand and needed explaining. Usually a few hands will be up which suggest that these students would ask the teacher to explain one or two questions which they had found to be difficult. The teacher then copied these question again on the blackboard and demonstrated how to answer these questions step by step. The procedure was always similar because, when the teacher was explaining, she would asked direct questions leading to the procedures of how to find the answer. The following lesson procedure which I wrote down in the observation notes highlight this procedure:

> 31/8/93 (7.30 am - 8.30 am)
>
> ...the teacher wrote down the question the students find difficult on the blackboard. This was; "The ages of 3 children are; 5 yrs 4 mts; and 4 yrs and 7 mths and 3 yrs and 7 mths. What is their average age?

> ND asked the students to read the questions aloud. She then asked the students: "What did the question ask you to do?" The students replied, in chorus, "Average". The teacher went on to ask; "So what do you usually do when the question asks you to find average?" The students replied; "Add and divide."
>
> The teacher started to solve the problems step by step.

The student would then copy whatever the teacher had written on the blackboard in their exercise books. As an alternative, sometimes, instead of the teacher demonstrating, she would call a few students who had answered the questions correctly in the exercise books to the blackboard to demonstrate their working to the rest of the class. For the rest of the mathematics period, students would continue doing more exercises which the teacher had prepared and written on the blackboard or sometimes as worksheets. Basically, the procedure of ND's mathematics lesson was, according to her:

> I will discuss with them their past lesson for a while, the mistakes they made and then after that I will give them the worksheets for them to work individually.
>
> (ND 6/9/93 B)
>
> ...I simply asked them to do work on the blackboard in front of the other pupils, to show to the other students how to answer questions...
>
> (ND 6/9/93 A)

Sometimes ND started her mathematics lesson by writing a

few examples of the mathematics questions on different topics on the blackboard. She would ask if the students had seen these types of questions before. If they had she would ask how they had answered these questions at that time. She would also ask a few students to come up to the blackboard to do the exercises. When they gave the wrong answers, she would explain how to do the exercises correctly to the whole class, and would then ask the students to copy them in their exercise books. If some of the questions were "new" to the students, and they admitted that they had never seen them before, then the teacher would straight away proceed to demonstrate to the students how they were solved. This type of teaching would go on until the end of the lesson.

"Lots of practice" seemed to be the 'backbone' of ND's mathematics teaching. According to ND, everyone seemed to benefit from doing "lots of practice" in answering mathematics questions:

> ...the clever students, when they find difficult topics like fraction, in order to help them to remember this one (the topic) we have to give them lots of exercises...the slow ones, they are still confused. I think we still have to practice more with them.
>
> (ND 1/9/93 A)

One teaching strategy that was regularly used by ND especially to explain word problems to the students, was using the "clues" in the questions. In one of my observation notes I wrote:

6/9/93: (7.30 am - 8.30 am)

> The teacher asked a student to read the question she wrote on the blackboard. The question was "A student arrived in school at 6.50 am. The journey from his house to the school takes 20 minutes. What time he left his house?"
>
> As soon as the student read the question, the teacher asked the class: "What did the question ask you to do?" The students answered, in chorus, "Minus". The teacher then asked; "Why minus?" The students' spontaneously replied; "Left". The teacher then underlined the word "left" in the question.

The teacher then went on to solve the problem, using subtraction. In this particular example, the word "left" referred to the teacher was used to signify "What time did he leave his house?" when in actual fact it was misunderstood by the students to means "minus". The question was formatted in such a way that it worked for both uses of the word "left", and the teacher got the right answer, at least for this particular question. Later in the interview after the lesson, ND explained:

> In word problems, I ask the students to look for clues. I, at the end say something like, "to find the sum, then you add and to find the difference, you minus."
>
> (ND 6/9/93 A)

The familiar format of the word problems in the workbooks and in the examination made it possible for the teacher to use the above method with confidence. This was revealed in one of the statements made by ND when she was asked; "What

happens if the questions in the examination have no clues in them?" and she replied:

> I don't worry: the questions always have clues in them. So I just have to follow these questions.
>
> (ND 1/9/93 B)

As long as the format of the questions remained the same, at least, this helped to simplify the teacher's method of teaching mathematics to the students who have a poor understanding of the questions, which are in English.

The stereotyped format of the question was also evident when the teacher used methods such as giving students a lot of practice to familiarise themselves with a previous examination question paper. ND admitted that:

> I think giving them a lot of questions like this (past question papers) helps them during the examination, to have the habit of learning mathematics and understanding the questions.
>
> (ND 31/8/93 A)

ND mostly used the blackboard, worksheets and previous PCE mathematics question papers in her teaching. Workbooks were no longer needed since, according to ND:

> I have ***covered*** all the scheme of work in August. Now I only concentrate on revision. I had ***covered*** all the possibilities.
>
> (ND 2/9/93 A)

Because ND usually used the blackboard for demonstrations,

revisions and classwork, it was not surprising to see that she arranged her class in rows. The main reasons for this arrangement was, according to ND:

> ...because they are only doing the exercises. I don't want them to copy from each other. They should be able to do the exercises by themselves.
>
> (ND 7/9/93 B)

The success of ND's teaching depended on her students' hardwork, attentiveness and discipline as well as the ability to remember what was taught to them by the teacher in the classroom.

The importance she put on the examination led her to teach only procedural knowledge. There was no time for conceptual understanding, according to ND, because the teacher was concerned about the lack of time needed for her students to practice all the possible patterns of questions in the examination and to cover the scheme of work. These concerns were real and affected her. She seemed to be restless when the students slowed their pace when they did their classwork. She kept on asking them; "What questions are you doing now?". She went round the class and, whenever she saw a student slowing down, she picked up a stool which she had ready in the classroom and sat beside that student and helped him/her to do the work. When asked later why she seemed restless and wanting to rush the students, she said:

> I feel I have to cover all the possibilities of the type of questions that will come out in the examination...One thing for sure, I

> am afraid pupils cannot do it, and I am afraid of the questions that come out, because we do not know the questions, because this examination (PCE) is centralised.
>
> (ND 2/9/93 A)

ND's anxiety about the results of her students in the forthcoming PCE examination might have had some effect on her relationship with her students in the classroom. In the following section, I highlight these relationship and the possible outcome of such a relationship on the students.

iii) ND's relationship with her students in the mathematics classroom

Although, from the methods of teaching mathematics highlighted above, ND seemed to subject her students to lots of work in doing the exercises, from my observations, the students seemed to understand that this was what was required of them in a mathematics lesson. I could sense that the students themselves were anxious about the forthcoming PCE examination and were eager to try answering as many questions as they possibly could. This was obvious because, when they had completed their work, they quickly let the teacher know and asked for more questions. In fact in one of the interview, ND explained to me:

> Doing a lot of exercises motivates the students. Doing activity, they don't consider that as learning seriously. They considered that is for small children.
>
> (ND 1/9/93 B)

The students depended a lot on their teacher in learning mathematics, and the teacher was the only source of knowledge as far as the students were concerned. That means memorising what was taught by the teacher as well as paying attention to whatever the teacher was doing or saying throughout the lesson was the priority in learning mathematics. Being seen to be knowledgeable to the students is important, according to ND, because this would earn the teacher the respect of the students. According to ND:

> ...a teacher should be a role model for the pupils. The teacher is a very strong influence on the pupils learning. If the children respect the teacher, they will learn more from him.
>
> (ND 7/9/93 A)

The students were not encouraged to help each other because "they would rely on the clever students" (ND 7/9/93 A). But they were encouraged to put up their hands whenever they had any problem. The teacher would be there, with her stool, seated beside the student and help him/her to carry on with their work. The rapport between the teacher and the students was very good. She knew her students very well and they her, because she had been teaching the same students at different levels, starting from primary 4 and going on to primary 6, over three years. Probably this long standing relationship with her students made her felt more responsible for her students' achievements in the examination. This could explain the anxiety she had for her students which resulted in her use of the teaching methods mentioned earlier. This was expressed by ND when she was asked how she felt about the PCE examination in October 1993:

> Nervous. One thing for sure I am afraid pupils cannot do it, and I am afraid of the questions that come out because we did not know the questions, because this examination is central.
>
> (ND 2/9/93 A)

The teacher admitted that she was under a lot of pressure when she was teaching Primary 6 because these students would be sitting for their PCE examination in October. The PCE result, especially in mathematics and science, was important to the students because this would determine, not only whether the students would be promoted to secondary school but also in the case of very good results would ensure that these students would go on to the most prestigious secondary school in the State, the Science College.

From my observations, I noticed that the students were hard working and always ready for more work given by the teacher. I supposed this was how the students perceived mathematics lessons should be. Learning should not be fun, in fact it should be done seriously. This was mentioned by ND, as quoted earlier:

> Doing exercises motivates students here (in Brunei). Doing activity, I don't think they consider that learning seriously. Maybe they consider that doing activity is for small children. They are in Primary 6, they should receive explanation of what to do and do lots of exercises.
>
> (ND 1/9/93 B)

In the previous sections, the analyses were based mostly

on observation notes as well as on the interview transcripts if some explanation were needed to explain the teacher's actions and behaviours in the classroom. In the following sections, it is hoped that the teacher's beliefs could be highlighted by analysing the interview transcripts.

5.4 SECTION C: Data generated from the interview transcripts to highlight ND's beliefs

i) ND's assessment of her own ability and skills in school mathematics and mathematics teaching

There were subtle hints in the interviews which indicated ND's lack of content knowledge and also lack of confidence in teaching mathematics. During my observation of one of her revision lessons, I could see that ND was confused when she was explaining about "Cost price and Selling price": she was not sure which was which in the question. this prompted me to asked her, later in the interview, her feelings about teaching mathematics. She admitted that:

> ...I sometimes feel confused about some topics, like fractions, too many numbers. Not all the time, only if the questions are involving big numbers. and also word problems. I sometimes find that sort of problem confusing.
>
> (ND 31/8/93 A)

It seemed that not only "big numbers" and "some complicated topics" that confused ND, they also made her feel "not confident to teach it." (ND 1/9/93 A).

Lack of mathematical content knowledge and also lack of

confidence coupled with the pressure of teaching primary 6 students probably prompted the teacher to use the teaching methods above. As long as the students were given enough practice in doing mathematics exercises, ND was confident that her students could pass the examination. The "unchanged" formats of these mathematics questions made it possible for ND to use the above method with confidence.

If ever she felt guilty, this stemmed from the accountability demands. This kind of guilt led the teacher to concentrate on covering the required content of the scheme of work and all the possible types of questions that could be asked in the examination. The guilt was from failing to do the job which was expected by her students, the parents and her Headteacher and colleagues, according to ND:

> I want to show to my Headteacher and the others that I had done my job and the other teachers too.
>
> (ND 2/9/93 A)

This statement could be linked to the effort to help students to pass the examinations, which led to the teacher trying to cover all the scheme of work, although she felt inconfident to do that because she said; "it is impossible to cover the scheme of work, it was too crammed." (ND 2/9/93 B).

Although ND was saying that; "if the result of the pupils is not good that means there is something wrong with our teaching..." (ND 2/9/93 B), ND was only prepared to take the blame "if the questions are simple and the pupils cannot do it" (ND 2/9/93 B). In other circumstances, the

teacher thought her students also contributed to their failures. In the following section such attributions will be highlighted.

ii) ND's attributions concerning her students' ability and motivation to learn mathematics

As mentioned earlier, ND believed that the success of her lesson depended on her students' hardwork, discipline, attentiveness in the class and ability to remember what was taught to them, and the ability to use these knowledge in the examination. Her role was to look for the right kinds of questions and give them lots of practice with these questions including regular revisions.

The ability to recall what they had learned was what ND considered lacking in these students. ND described some of her students as "forgetful". For example, in the interview, she said that she was anxious about the PCE examination because, according to her:

> I am not sure if they can do the questions in the examination. These students, they always forget when the real day comes. Suddenly they cannot remember, as if they have never seen the questions before.
>
> (ND 7/9/93 A)

This attribute was mentioned several times in the interviews by ND during the two weeks observation. The following excerpts were taken from the interview transcripts which, according to the teacher, justified the methods of teaching she used:

> ...the slow ones, they always forgot the formula. They are still confused. I think we still have to practice more with them.
>
> (ND 1/9/93 A)

> At that period, okay, then tomorrow still okay, but later on when they do the same questions again, they forgot about it. This is where drilling should come in.
>
> (ND 6/9/93 B)

> ...these students, if you don't remind them again and again they will forget. They sometimes forget the formula. And sometimes even how to calculate, especially long division. So that is why we have to practice and practice.
>
> (ND 6/9/93 B)

As mentioned earlier, the teacher's attributions of her students played a significant part in the choice of teaching strategies that the teacher used in the class. These are, doing "lots of practice", and "drills" which were consistent with the teacher's teaching practice as observed throughout the two weeks' mathematics classroom observations.

Besides being forgetful, the teacher attributed the students' difficulty in learning mathematics to their poor understanding of the English language, which is used as a medium of instruction for teaching mathematics (and other subjects) in Brunei Darussalam. This attribution led to ND teaching word problems by teaching the students to look for "clues" in the questions.

There is one interesting point I would like to make regarding ND's attributions on her students' ability. On one occasion, I wrote down in my observation note the following comment about her lesson:

> 1/9/93 (7,30 am - 8,30 am)
>
> Further observations:
>
> The teacher gave the students 10 questions (quite long and difficult) written on manila cards and asked the students to solve them within 30 minutes.
>
> 10 word problems were done within 30 minutes and most students got them correct. Despite the teacher's comment about her students' lack of understanding of the word problems. How was this possible?

iii) ND's beliefs about school mathematics and mathematics teaching

What has been done so far in this analysis is to describe ND's mathematics teaching practice in the classroom and try to relate these practices to ND's beliefs about her skill and ability in teaching mathematics and her students' ability and motivation in learning mathematics. The analysis also highlighted the fact that ND was anxious about her students sitting for their PCE examination in October, about a month away from the time when the interviews and observations took place. Therefore, as expected, ND's beliefs about school mathematics and mathematics teaching would be affected by this examination. In the interview, ND said that:

> School mathematics is not everyday mathematics, for example Algebra and geometry are school mathematics. It is still important to learn mathematics from the school. That is what a mathematics lesson is all about.
>
> (ND 7/9/93 A)

It seemed that ND believed school mathematics represents symbols and formulae such as those found in Algebra and Geometry to be solved outside the context of everyday life mathematics. As for mathematics teaching, ND considered that her mathematics teaching as a stage of preparing for "war" in which she planned various strategies to "win' it. Some of the strategies she used in the classroom were described as metaphors. For examples:

> I must <u>really prepare</u> my students.
>
> (ND 31/8/93 B)
>
> I have <u>covered</u> all the possibilities.
>
> (ND 2/9/93 A)
>
> ...just <u>polishing</u> their skills in answering questions.
>
> (ND 31/8/93 B)
>
> I want them to be <u>on guard</u> all the time...
>
> (ND 31/8/93 B)
>
> We have to put in their heads <u>always ready</u> for the examination.
>
> (ND 6/9/93 B)

> We must finish all the topics. Can you imagine, like running, we have to rush.
>
> (ND 2/9/93 B)

The way she translated some mathematical concepts to describe her teaching methods had to be taken in the context she referred to during the interview. for example, when she said: "I always used **activity method..**" I asked her to explain what she meant by **activity method** and she replied:

> Usually based on example. And then I explain to them and they still find it difficult, then I discuss again to them and they still find it difficult, then I discuss again with them.
>
> (ND 6/9/93 B)

So, **activity method** according to ND is to repeat the explanation over and over again to the students on the blackboard.

5.5 SUMMARY

ND's mathematics teaching reflected the practice of those teachers teaching Primary 6 students in Brunei Darussalam. this was confirmed by ND during Validation 1, when she was asked how she identified herself in the Validation 1. "I was doing revision. I was teaching Primary 6, and this teacher (teacher D) is typical of the style of primary 6 teachers here (in Brunei). However, ND confirmed that her teaching methods are consistent even if she is teaching other classes:

> If I am teaching primary 4 or 5, I would use the same methods of teaching, maybe less doing exercises.
>
> (Validation 1)

This is the stage of the primary school when anxiety runs very high among the teachers, students and their parents. There was hardly any time spared in the mathematics lessons except for practice and more practice in case the students had forgotten what they had learned or they had missed on some of the types of questions that could be asked in the examination. In Validation 2, ND agreed with the statement from 2.3 (Appendix X) which suggests the same view stated above.

The way she translated the words "activity method" further highlights her beliefs about school mathematics and mathematics teaching. ND believed that the method of teaching she used in the classroom provided her students with the chance to pass the examination. Afterall, by studying the past question papers of the PCE examination, the teacher could predict which ones would appear. Probably, I believed that with the same types of questions being asked year after year, it is not unreasonable that the teacher would use that knowledge to teach her students mathematics. Afterall, the objective was for the students to pass the examination.

Another reason that might explain ND's teaching practice, especially using key words and clues, was the Bilingual system of Education in Brunei Darussalam, whereby the students as young as 9 years old have to switch the medium of instruction from teaching mathematics and other

examinable subjects from Malay to English. The word problems in mathematics were difficult for the students to understand, rightly so, since they had had just two years of experience learning the foreign language. Therefore, to help the students, the teachers had to resort to using a simpler method, namely, identifying keywords and clues in the questions to determine which operation to use. In Validation 2, ND agreed with statement 4.2 which refers to the teacher's use of keywords to solve word problems. Logically, there must be time when the "clues" as referred by the teacher did not point to the correct operations but, most of the time, thanks to the similarity in the types of questions in the textbooks, workbooks and in the examination, the strategy of identifying "clues" worked.

From the facts highlighted above, ND's teaching was influenced mostly by the examination. Another factor that seemed to influence ND's teaching was her own lack of skills and mathematical content knowledge. This was also supported by ND in Validation 2 statement 6.3 (see Appendix X) which stated that teachers are not confident of teaching "difficult" mathematics topics. It was important for the teacher to "cover up" her lack of skills and knowledge in front of her students because she believed that teachers should be respected, and one of the ways to be respected was to appear to be knowledgeable. Therefore, the teacher made sure that teaching and learning came from her, and her students were not allowed to seek from friends or parents.

As mentioned by the Headteachers, to whom I referred at the beginning of the case study, ND is a good teacher, hardworking, and in charge of one of the projects in the school. This goes to show that teaching in ND's classroom

was acceptable to the Headteacher as well as to her colleagues and students. So I could not bring myself to say that ND's teaching was depriving her students the right to more in-depth knowledge and understanding than the "artificial" knowledge portrayed in her teaching. This will be further discussed later in Chapter 6 of this thesis.

5.6 CASE STUDY 2 : HM

5.7 SECTION A: HM's Profiles

HM is in his late twenties, and graduated from UBD with BA (Primary Education) degree in 1990. He joined the university straight after his G.C.E "A" level. He had no teaching experience prior to joining the University; therefore he was required to spent 4 years in the University instead of the normal 3 years for in-service teacher training.

HM was teaching primary 5 (a class of 10 years old) when he was interviewed and observed for the Phase 2 study in August 1993. He had also taken part in the Phase 1 study in 1992. At that time he was teaching primary 4 class in the same school. The school in which HM was teaching is one of the schools built before Brunei Independence in 1985, and is situated in the Capital of Brunei Darussalam, approximately 5 miles from the University.

His classroom was on the ground floor of a two-storey school building. The classroom was quite small compared to most of the new primary schools just built after the Brunei Independence in 1985. Nevertheless, the classroom was pleasantly decorated with posters and charts, mostly made by the teacher. There were 30 students in the classroom, and they were arranged in 5 small groups, 3 groups of girls and 2 groups of boys. A unique feature of HM's classroom was that he grouped his students, I did not see that in the other classes in the school. Also, he had his desk positioned at the back of the class, which I found to be different from most teachers' practice in Brunei Darussalam

who preferred to put their desks in the front of the classrooms. HM explained that he did not want to distract the students when they were copying things from the blackboard; he felt that the students must have clear view of the blackboard.

As usual with timetable arrangements in other primary schools, HM's mathematics lessons which I observed were in the first two periods in the morning. I went into the classroom with the teacher at the beginning of the mathematics lessons, after interviewing him in the staffroom. The class awaited the teacher, seated quietly in their own seats. As soon as we entered the class, the students stood up and greeted us with "Good morning, teachers" and "Assalamulaikum Chigu" (Arabic words for "Peace be with you, teacher"). This was followed by reading of the prayer by the class monitor, repeated by the rest of the class. Only after one other formality, marking the attendance register did the mathematics lesson begin.

In the following sections, I will analyse the data regarding HM's mathematics teaching in the classroom, according to my observation notes and interview transcripts.

5.8 SECTION B: Data generate mainly from the observation notes to highlight HM's teaching practice in the classroom

i) HM's attempts to achieve his teaching goals

It makes sense first to find out what were HM's teaching objectives and then to see if these were reflected in his teaching strategies. HM's teaching goal was based on the specific topics he was teaching during my observations. For

example, HM's objective of teaching a mathematics topic (symmetry) was, according to him:

> ...I want them to know about symmetry so that they can do the exercises given to them later.
>
> (HM 16/8/93 B)

Another example was the objective of teaching about "Time" which was simply, according to HM, because other teachers who were teaching the same level had already taught the topic and he did not want his students to be disadvantaged in the monthly test:

> I have to teach Time, I am already far behind the other classes. Now the other classes are already doing Time. Because we are doing the monthly test very soon; the other classes said they are going to include Time in the test.
>
> (HM 19/8/93 B)

HM's goals as shown by the examples above were geared towards fulfilling the requirements of the monthly test which meant that the teacher had to cover all the topics to be included in the test, before the students could sit for it. Therefore, his mathematics teaching was geared towards practising answering the questions in all the topics which would be included in the monthly tests.

The methods of teaching that HM used to achieve his goals will be explained in detail in the next section. In this section, however, I will, highlight the method that HM used to evaluate his own teaching.

To evaluate if his teaching was successful, HM referred to

his students' ability to answer the questions given to them in the classroom. Therefore, at the end of every lessons I observed that the teacher would ask his students to do exercises, mostly from the workbooks and checked by going round the groups while they were doing their work. the students' ability to answer most of the questions from the workbook was an indication for HM to consider that his lesson was successful. For example, he said at one of the interviews that:

> ...if they can answer the questions from the workbook and they can draw the axis of symmetry, I think they have learnt something, and I think I have achieved my objectives.
>
> (HM 17/8/93 A).

He went on to say:

> I can see that most of them can answer the questions correctly, so I think they must have understood the lesson. Otherwise I don't think they can answer the questions correctly.
>
> (HM 17/8/93 A)

In the following section, I will highlight further the teaching methods that I observed being used by HM teaching mathematics in the classroom. As these teaching strategies were analysed, it could be assumed that these strategies were chosen by HM specifically with his teaching goals in mind.

ii) HM's Teaching Practice - The teaching strategies that he used in the mathematics classroom

HM's typical teaching methods used during my two weeks

interactions with him will be described in this section. First, in term of his classroom arrangement, then secondly in term of his teaching strategies. HM grouped his students into 5 smaller groups, 3 groups of girls and 2 groups of boys. The teacher's desk was at the back of the class.

The teaching method for teaching the topic on "Time" what HM used in the classroom was, according to my observation notes:

> 23/8/93 (7.30 am - 8,30 am)
>
> First, the teacher put one clockface in front of each group of students. Then, he went to the front of the class, near the blackboard with a bigger clock face with movable hands.
>
> Secondly, the teacher took the clockface and started to ask the students the names of the hands of the clock. The students could answer correctly (in chorus).
>
> The teacher proceed to show to the students how to place the hands of the clock to show the times. For example, "put the minute hand on 12, and the hour hand on 3. What is the time now?" The students answered, in chorus, "Three o'clock". Then the teacher drew the clockface on the blackboard and wrote "3 o'clock" under the clockface.
>
> This practice of telling time went on for about 10 minutes before the teacher asked the students to take out their workbooks and do the exercises as given in the examples on the blackboard.

This procedure was also used by the teacher when he

introduced the topic of "Symmetry". He described his teaching strategy when he was asked how he was going to introduce the topic of "Symmetry":

> First, understanding of symmetry, I will distribute to them the square paper, then I do myself, demonstrate to them and then ask them to do what I do. And then I draw on the blackboard, what happen, step by step, so that they understand how to find the line, that we called axis of symmetry. And then I give them worksheets to do.
>
> (HM 16/8/93 A)

To introduce the topic "symmetry" which was on my first day of observation, HM asked the students to face to the front of the classroom, where the blackboard was situated. The teacher distributed the geometrical paper shapes on the tables in front of each group, the same type of teaching aids he was going to use in his demonstration that was to follow. HM stood in front of the classroom and asked the students to observe what he was doing. He folded a square paper, showed to the students the folding lines, and wrote "axis of symmetry" on the blackboard. Then he went on draw the shape that he just folded and drew dotted lines to indicate the "axis of symmetry". Throughout the demonstration, the students were quiet and observed very closely to what the teacher was doing. In the process, the teacher asked several questions, which the students answers in chorus. For example, "What is the name of this shape?" and the students would answer "a square" and so on. HM commented to me about this particular teaching in the interview after the lesson:

> ...I was surprised really that they still can remember the name of the

> shapes, like rhombus, isosceles triangle. They can identify the shapes, They learned this some times ago, but they can still remember (laugh).
>
> (HM 16/8/93 B)

HM then asked each of the students to take a square shape from the desks in front of them and he asked them to fold the shapes as he had done before. Then the students would copy what was drawn on the blackboard. The teacher went on to demonstrate folding of the other shapes, and counting the axis of symmetry of each shape. The procedure was repeated until all shapes were used. While the students were imitating what the teacher was doing, they were allowed to talk and help each other. HM explained:

> I like my students to learn from each other. I notice one thing, they learn better if their friends explain to them than me...
>
> (HM 16/8/93 B)

From my observations, the students only helped their friends in the same group, doing what the teacher had just demonstrated to them. Real discussions about what they were doing rarely occurred.

HM's method of teaching mathematics was typical of the mathematics teaching by a teacher who had recently qualified from the Teacher education course. He admitted that "I think we were shown how to teach "Time" the same method in UBD" (HM 17/8/93 A). If this was the case then he portrayed a picture of a combination between being influenced by his mathematics pedagogical course in the

University and by the pressures from the school and society to make sure that all his students would pass the examination. On the one hand, he used the teaching aids to introduce his mathematics lessons, as in the case of teaching "Time" mentioned earlier, and on the other he had to make sure that his students had enough practices in answering the mathematics questions according to those that would be asked in the examination. This was done by spending three-quarter of the lesson doing the exercises from the workbook. In one of the interviews, HM said to me that because of the pressure of the examination in two months time:

> I had to teach that one (time). I was already far behind the other classes. This is where I feel the student need drills, I drill them like old method used by other teachers,
>
> (HM 18/8/93 A)

Therefore, it seemed from the above episode in HM mathematics teaching, he was using a teaching method that he believed could satisfy both influences.

The teaching methods HM used above was referred to by him as **practical work**, according to him, he did not use these teaching strategies for all the topics in the scheme of work, HM said that he only used **practical teaching** such as those he used for teaching "Symmetry" and "Time" on easier topics. In the interview he said:

> I used this teaching method (demonstration using teaching aids) depending on the topics. If I see that it is very easy for the students, I use the practical. But

> if it is difficult, I use the traditional method.
>
> (HM 18/8/93 A)

What was important, as I noticed during my observation, was that the demonstrations that the teacher carried out infront of the class were a part of the activities shown in the workbook, which were later to be translated into exercises. So in actual fact, the teacher did not plan his own demonstrations. But the fact was that the teacher cared to follow the instructions which were stated in the workbook, instead of going straight for the exercises.

The demonstration using the teaching aids was quickly followed by another type of demonstration, which was, how to solve the problems in the workbook. The teacher would pick up two questions or sometimes more, write these questions on the blackboard, and then asked his students to read one of the questions altogether, and then demonstrated to the students, using a step by step procedure, how to solve this question. Then the teacher repeated the same procedure with other questions. The students, then copied the examples shown by the teacher on the blackboard into their exercise books. The teacher then asked them to continue working by doing the exercises from either their workbook or cyclostyled worksheets. During this part of the lesson, the students were not allowed to talk to each other although they were still seated in groups. In the interview after the lesson, HM explained that the reason for not allowing the students to talk to each other when they were doing the exercises was:

> ...when they do exercises, they will have to do on their own, otherwise they copy from each other. That is natural, isn't it?
>
> (HM 18/8/93 B)

With other topics such as "Time" which had previously been taught, either at the same level or the level before, the teacher would start the lesson by revising that topic by giving the students oral questions based on it. In this case the topic was "Time", with the focus on months and years. He asked them questions such as "Can you tell me the names of months in a year? How many months are there in a year? What months have 31 days? etc." (Observation note 19/9/93). Then after this revision phase, he started to introduce the topic of the day. He wrote 3 questions on the blackboard and called 3 students to answer the questions. The questions were all on addition concerning months and years. In the observation note, I wrote the following about this lesson:

> 19/8/93 (&.30 am - 8.30 am)
>
> The students could only answer question 1, neither of the two. The teacher asked another two students to come to the board to do those two questions again.
>
> The two students could do them. The teacher did not explain to the class how to get to the correct answers. The lesson switched to the clockface.

In this particular incident, HM did not explain to the rest of the class why certain students had got the answers wrong and the others had got them right. Probably he assumed that since these were students' work, the rest should be able to understand them.

The teacher went round the classroom from one group to another while the students were doing their exercises. In

an interview after a lesson, HM explained that he had to supervise his students individually because:

> ...Sometimes funny, if they are confused how to do the exercises, they keep quiet.
>
> (HM 25/8/93 A)

I also noticed that another method that HM used to help his students who had completed their work was by using fellow students who had completed their work correctly to help the less able ones in their respective groups. The teacher seemed to recognise those students who he could use as student teachers to help him with the teaching. HM mentioned to me that the reason why he used these students to help their friends was:

> ...maybe, one or two will come up to me and ask me to help them with their problems. Maybe the others prefer to ask their friends. They will discuss how to answer the questions.
>
> (HM 19/8/93 B)

Usually HM's class demonstrations took about 10 to 15 minutes; the rest of an hour periods was spent on doing exercises. HM admitted that his students always enjoyed the first part of the lesson, the demonstrations and the follow up activities by his students:

> I think they enjoy it (the activity). Before I did the same with fractions, graphs, I did the practical work.
>
> (HM 16/8/93 B)

But he had to spend most of his teaching time asking them to do the exercises.

The teacher gave several reasons why he included the demonstrations at the beginning of the lesson, although, as he said earlier, he was worried that he could not cover all the topics in the scheme of work. One of the reasons was, he said; "that was how I was taught in the University to introduce a mathematics topic." (HM 16/8/93 A), and secondly, because these diagrams, such as drawing the axis of symmetry of a shape and showing time on the clockface were included in the examination. Another reason was because, in the workbook, the questions required the students to do their own activity, according to HM:

> The pupils will try to answer the questions using the clockface they made themselves beforehand. that is what is required by the questions in the workbook, so we have to follow,
>
> (HM 23/8/93 A)

HM's mathematics teaching provides another example where teachers in Brunei were very concerned about the examination and anxious to cover all the topics in the scheme of work. Because of this emphasis, the teacher would provide students with exercises to practice. The teacher put the need of the examination first before the students' learning and understanding of school mathematics. The urgency of getting good result meant a lot to HM:

> I want my class to be the best. Because from the beginning my class is always the best. In every monthly test all my students pass the examination. There is no failure.
>
> (HM 23/8/93 B)

The emphasis that the teacher put on examinations clearly

had some effect on the way the teacher treated his students in the classroom. Therefore, in the next section, I will highlight the relationship between the teacher and his students when they were engaged in the teaching-learning situation in the classroom.

iii) HM's relationship with his students in the mathematics classroom

The atmosphere of HM's mathematics classroom was quite relaxed although he insisted that he was worried if he did not cover all the topics in the scheme of work (HM 19/8/93 B). In addition, although earlier HM mentioned that every monthly tests all his students pass the tests, HM is expectations of some of his students were still low and according to him they "were very weak in mathematics", "shy" and "forgetful".

With the exception of the time when the students were doing their written work, the students were allowed to talk to each other, walk about in the classroom and sometimes exchange groups. HM admitted that allowing the students more freedom in the class to talk to each other contributed to their positive attitudes to learn mathematics although for a brief period only. Before such a lesson he would say:

> I think they will enjoy it (the lesson). I know it will be chaos in the beginning because they are going to share the teaching aids. But I think they will enjoy the lesson...Not like when they do exercises. That they will have to do on their own. Otherwise they will copy from each other.
>
> (HM 18/8/93 B)

HM was referring to the noise, and enjoyment showed by the students when they were given the freedom to talk and discuss when they were doing the "practical work" and the atmosphere of the classroom when they were doing their exercises. I did not find any indication that the students disliked doing the exercises: in fact they seemed to enjoy that as well. In my observation notes, I wrote about the relationship between the teacher and the students:

> 23/8/93: Further observation
>
> 1. The students seemed to be happy and were enjoying the lesson when they were using the clockface to tell the time, and even when they were doing the exercises afterwards.
>
> 2. The teacher seemed to be confident when he introduced the lesson.
>
> 3. Another strong characteristic of the class was that the students were lively, allowed to talk and discuss with their friends, and were allowed to move round the class. The teacher seemed to have a good rapport with the students. They called him to their groups when they had problems with their work.

What seemed to make the lesson enjoyable for the students were the demonstrations and the "practical work" they did afterward with the same types of teaching aids. For example, the day when the teacher was using a mirror to demonstrate how to find an axis of symmetry, I wrote in my observation notes:

> 18/8/93: Further observations
>
> The students seemed to enjoy the lesson. There was noise in the class, but they were experimenting with the mirrors.

HM used demonstrations in all his teaching that I observed except when he revised his lessons of the week, usually on the Saturday.

During the class sessions, the teacher would go round from group to group to help the students who needed help. HM reckoned that he had to look for these students who had difficulties, because according to him, some of the students were, as mentioned earlier, "very shy" and "if they are confused about how to do the exercises they keep quiet." (HM 25/8/93 A). HM also let the cleverer students help their friends who were in difficulty. HM knew that some of his students were shy, and they would "prefer to ask their friends. They will discuss how to answer the questions." (HM 19/8/93 B)

Sometimes, the teacher would be sitting at his desk and would call the students who had problems with their written exercises one by one to his table and explain to them how to do them. Or the students would come to him simply to ask "Teacher, can you tell me how to do this?" or "Teacher, do I have to plus or times?" or simply to attract his attention by saying "Teacher, is this correct?" (Observation note 19/8/93)

From my observations, I could see that HM's students were lively and were enjoying most of his mathematics lessons. He was very sympathetic towards his students, especially the weak ones. He often called them to his table, one by one, while the rest of the class were doing their work. He seemed to know which students needed his help and which ones were able to work on their own. HM seemed to enjoy teaching his class as well, probably because he was motivated, as quoted earlier:

> I want my class to be the best, because from the beginning my class is always the best. Every monthly tests all my students pass the examination.
>
> (HM 23/8/93 B)

To understand more the underlying beliefs which explain why the teacher was teaching mathematics the way he did, in the following section, using data generated from the interview transcripts before and after the observations were conducted HM's beliefs will be highlighted.

5.9 SECTION C: Data generated from the interview transcripts to highlight HM's beliefs

i) HM's assessment of his own ability and skills in school mathematics and mathematics teaching

HM expressed that he was confident in teaching mathematics for two reasons: one was if "the topic is not difficult, such as Symmetry" (HM 16/8/93 B) and the other was because he knew he had "only one or two students who were still weak in mathematics, so I can just revise with them." (HM 19/8/93 B). HM mentioned that he likes teaching mathematics, but he also had anxieties about teaching the subject because of lack of time. As quoted earlier, HM said:

> Really the problem is time. I am already far behind the other classes. Now the other classes already on the topic "Time".
>
> (HM 19/8/93 B)

The importance of keeping up with the rest of the classes,

and covering all the topics which would be included in the next monthly test as expressed by the teacher was related to his feeling of guilt if he failed to do just that. To save on teaching time, he resorted to more "traditional" methods. For example, HM said, "...divisions will always slow them down. This will make me go back to traditional method." (HM 18/8/93 A). This was also clearly stated in the following statement, when HM was asked what worried him most in teaching mathematics. According to the interview transcript he said:

> For me, the topics that I am going to teach worry me most. If we don't cover a topic and just leave it, I am scared that the questions about it will appear in the examination. Maybe I will be blamed for it.
>
> (HM 19/8/93 B)

The teacher's confidence in teaching mathematics was related to his ability to cover the topics in the scheme of work in time for the next test and to his confidence that most of his students were able to do the exercises, instead of teaching the mathematics subjects per se. For example, easier topics such as Symmetry were more time-saving as mentioned by HM:

> If they understand quickly, that means the topic is easy. I shortened the time to only 3 days (instead of a week). Further more I can use the time for other difficult topics.
>
> (HM 16/8/93 A)

ii) HM's attribution concerning his students' ability and motivation to learn mathematics

It is interesting to note that all teachers interviewed in this study shared almost the same views and beliefs about their students. HM was not an exception. His attributions about his students, in some ways had, together with other factors such as the centralised examination and the Bilingual system of education influenced his method of teaching in the classroom.

Although throughout the interviews, HM mentioned his feeling of confidence that all his students would pass the next monthly tests, and only one or two were weak in mathematics, HM still attributed the possible success or failure of his mathematics teaching to his students.

The teacher attributed some of his students' failure to their own "forgetfulness". This gave him an excuse to do some revision work regularly. He expressed this as part of his anxiety of teaching mathematics:

> I am scared that they may fail, though I am confident they can pass. I am worried, especially during holiday, they might forget. That is why I have to revise from the beginning of the year.
>
> (HM 23/8/93 A)

Sometimes the teacher's anxiety was not fully justified, there were times when the students indicated that they did not forget what they had learnt, this was happening in one of the lessons I observed. The lesson was on "Symmetry" and the teacher was showing to the students the paper shapes he was going to use for his demonstration. He asked the students; "What is the name of this shape?" (showing a rhombus) and the students answered, in chorus, "rhombus".

He did the same with the other shapes, and the students could named the shapes correctly. In the interview after that lesson, as quoted earlier, the teacher expressed his relief and disbelief that his students could still remember:

> When I asked them the names of the shapes, I was surprised they could still remember the names of those shapes, like 'rhombus'. They identify the shape. They learnt about them much earlier, but they still can remember.

Although he also said that:

> Usually if they learned the topic last year, they cannot remember. We have to tell them again and again. But this time, I am glad they remember this time.
>
> (HM 16/8/93 A)

Another attributions and the method that HM used to overcome the attribution was that, some of HM's students he believed were "very weak in mathematics" (HM 19.8/93 A). He also believed that because they were very poor in calculations:

> ...they will never be able to understand, and I had to practise and practise with them again and again.
>
> (HM 19/8/93 A)

The teacher considered some of her students were "quiet" and "shy", especially "if they are confused how to do the exercises they just keep quiet." (HM 25/8/93 A). These were the students that the teacher often called to his desk in order to help them, or ask other students to help them with their work.

The Bilingual system of education also contributed to the teacher's other attribution of his students. This had to do with the students' lack of understanding of the English language. To help the students to understand the questions, especially the word problems which were in English, instead explaining the questions, he tried to teach his students:

> ...to look for clues in the questions. It is easier to look for clues, because by looking at one word they know what to do. Like together means plus...
>
> (HM 23/8/93 A)

The teacher's approach to mathematics teaching was relaxed and his relationship with his students was good and he was caring. He tried to overcome his students' weaknesses in whatever ways he could, for example using the cleverer students to help him get across to the "shy" and "weak' ones. But as mentioned throughout the sections above, the teacher was still anxious about the examination and covering the topics in the scheme of work. These anxieties would influenced the teacher's beliefs about school mathematics and mathematics teaching.

The next section will examine the teacher's beliefs about school mathematics and mathematics teaching.

iii) HM's beliefs about school mathematics and mathematics teaching

The teacher's beliefs about school mathematics and mathematics teaching were influenced by the pressures of the monthly tests and examinations. Time was the commodity that the teacher could not afford in Brunei Darussalam

because of the monthly tests and examinations. The teacher's concerns in covering the scheme of work and preparing for the examination led him to concentrate on giving students exercises especially from the workbook. To save more time, the teacher was selective in the topics that he would introduce by using teaching aids for class demonstrations. Otherwise he would use the more traditional method of demonstrations that is, demonstrating to the students how to do the exercises using a step by step procedure. This was mentioned by HM, quoted earlier:

> If I see something is very easy for the students, I use a practical. But if it is difficult for them I use a traditional method.
>
> (HM 23/8/93 A)

The term "**practical**" as it was used by the teacher in this quotation was explained earlier. The teacher had this notion that he could provide his students with better chance to pass the examination as long as he gave them:

> ...a lot of practice in doing the problems especially from the workbook, because the questions in the tests will be the same as from the workbook.
>
> (HM 18/8/93 A)

This was an indication of what HM considered to be good learning behaviour from his students. The teacher's view of learning also influenced his method of teaching in small way. For example, the teacher believed that learning mathematics required effort and hardwork from the students, not necessarily intelligence or ability. This was obvious from the following statement:

> ...like word problems, for me the more they do the more they will understand. I mean doing exercises, doing a lot more of the exercises.
>
> (HM 19/8/93 B)

The emphasis on the monthly tests and examination was evident in the metaphors used by the teacher to express his beliefs about mathematics teaching. Judging from the metaphors used by the teacher, it seemed that HM considered that the process of learning school mathematics is a "race" or a "competition", and his mathematics teaching methods were a means of training students to win that competition which included a lot of practice. The following are some of the metaphors the teacher used which I considered indicating that teaching and learning mathematics was a "competition" or a "race":

> ...divisions will **slow them down**. This will make me go back to traditional methods.
>
> (HM 18/8/93 A)

> Have to teach that one (Time). I am already **far behind** the other classes.
>
> (HM 19/8/93 B)

> ...where I feel the students needs **drills**, I **drill** them like old method we use. Sometimes, depends on the topics.
>
> (HM 18/8/93 A)

> I don't have a problem as long as I give them **lot and lots of practice** using workbook or past question papers.
>
> (HM 18/8/93 A)

5.10 SUMMARY

HM's mathematics teaching was typical of UBD students teachers' teaching during teaching practice. The only difference was that these student teachers need not worry about the school tests or examination. HM was, however, very anxious about these tests and examination. Therefore, he chose the topics with which he could use teaching aids because he still remembers these methods taught to him in the University, "especially the easy ones", and with those topics which he considered difficulty, he would go straight to explaining to the students how to solve the problems, just to save more time. This was where the reality of teaching mathematics in a real classroom influenced the teacher's choice of teaching methods. It seemed that the demonstrations using the teaching aids mentioned earlier were used as an add-on to the HM's teaching, as a reminder that this was the type of mathematics teaching that was taught to him in the university. And he was obliged to follow this procedure. He said that, for having an introduction using teaching aids he chose "easy" topics only. With the more difficult topics he had to resort to "traditional methods" (HM 18/8/93 A), and that he used such methods also because activities were suggested by the workbook, although they were an integral part of HM's mathematics teaching for understanding.

One term that was used by the teacher and which could be misinterpreted was the term **understand**. HM referred to the word **understand**, for example when he said "the more they do the exercises, the more they will **understand**. (HM 19/8/93 B). In this context, as in others, the ability to **understand** as referred to by HM was that the students were be able to use the examples given for solving similar exercises.

Like the other teachers who took part in the study, HM's teaching objectives was to enable his students to answer the questions in the exercises in the hope that these students could reproduce this work in the tests and examinations. The traditional way in which the questions were asked in the tests and examinations made it conducive for the teacher to use the questions that were available in the workbook. The teacher also believed that for primary 6 students, which he would be teaching the following year, he said:

> ...revise all the questions in PCE examination and I had understood all the techniques.
>
> (HM 23/8.93)

This was substantiated by HM in Validation 2 statement 1.2 (see Appendix X). This method of preparing questions for tests and examinations would discouraged the teacher to be more creative in formulating his own mathematics questions.

The teacher's classroom arrangement deserves to be mentioned in this analysis. The small groups that HM used in the class really helped his students to communicate with each other especially when they were doing activity work,

and even when they were doing exercises, HM allowed the cleverer students to help the others in the groups. His class was quite informal, and had quite a relaxed atmosphere. although some students were very shy and quiet, grouping helped them to talk to the others in the same group, and the teacher made sure that he called them, one by one, to his table, to ask them if they had any problems with their work.

HM's class was considered to be one of the best primary 5 classes in that school according to the Headteacher I talked to earlier. And HM was very proud to acknowledge that; "...from the beginning my class is always the best." (HM 23/8/93 B). But two questions remain, Why then, did HM give negative attributions to his students? and why did he say it was natural for the students to copy from each other, if they were given the opportunity to do so? These attributions seemed to be the same among the teachers in this study.

I found that HM was quite confident of teaching mathematics: his students seemed to understand what he was teaching and were able to do most of the exercises that he gave them, despite his attributions that "they were weak in mathematics", "forgetful" and "shy". He communicated very well with the students although most of this communication only revolved around the explanation of how to answer the questions. He was also sympathetic towards those who were not able to do their work by asking the other students to help them.

5.11 CASE STUDY 3: Teacher NA

5.12 SECTION A: The teacher's profile

NA is in her early thirties, and has been a teacher for the last 10 years, five of which were overseas teaching Secondary school. Her highest qualification is B.Sc. in Biology. She had no formal teacher training course when she was teaching overseas, but when she applied to work as a teacher in Brunei she was asked to attend a one-year in-service teacher training course in the Institute of Education to enable her to teach in Primary schools. She has been teaching in the same school for the last 3 years.

NA was teaching primary 4 (a class of 9 years old) when she was observed and interviewed in September 1993 for Phase 2. She took part in the Phase 1 study as well in 1992. At that time she was teaching Primary 6 in the same school. NA's classroom was on the first floor of a three storey school building. The classroom was very clean. Posters were on the walls, mainly commercial posters brought from overseas, posters about science topics, the mathematics multiplication tables, vocabulary for English lessons etc. There were no other teaching materials, except for the chalk and board, seen in the classroom. On one side of the classroom, NA had a white board. On it was written the names of ten students who had obtained the highest marks in the August 1993 monthly test. This was used, according to NA, as "motivation" for her students to put more effort into the next monthly tests.

In the classroom the students were arranged in rows, 3 rows of boys nearest to the teacher's desk and 3 rows of girls at the other end of the classroom. Segregation among the

boys and the girls is encouraged in the schools in Brunei Darussalam.

The mathematics lessons were usually the first two periods in the morning. I interviewed her in the staffroom before going to the classroom. Before the teacher arrived in the classroom, the students were already seated quietly waiting for the teacher. As soon as she entered the classroom, the students stood up to greet her with "Good morning, teacher". After that a prayer was read by the class monitor, and then repeated by the rest of the class. Only then did the mathematics lessons start.

In the following sections are the analysis of the data from the observation notes I took while observing the teacher teaching mathematics and also from the interview transcripts which were taken before and after the lesson observed.

5.13 SECTION B: Data generated mainly from the observation notes to highlight NA's teaching practice in the classroom

i) NA's attempts to achieve her teaching goals

NA's goals were not only mentioned during the interviews before the lessons but also reflected in her classroom practices. Her classroom teaching was geared to making her students able to answer the mathematics questions that she gave them during the mathematics lessons. The methods of teaching she used to achieve her teaching goals will be explained further in the next section. More specifically, she tried to enable all her students to answer most of the questions given to them. This was mentioned in the interview, when she was asked about her objective of teaching "Time":

> To enable the students to solve simple word problems on Time. It is important that the students should be able to do the four operations. This is basic mathematics.
>
> (NA 13/9/93 B)

To enable NA to evaluate her success in achieving the objectives of her lessons, NA explained that she had to wait for the results of the students' classwork. That means that, immediately after the lesson, when she was asked if her lesson was successful, she could not tell because she had not yet corrected her students' classwork, except in the cases when the students were asked to solve some mathematical questions on the blackboard as part of NA's lesson presentation. According to NA:

> When they do the problem on the board, maybe that alone I will know if they understand my lesson or not. After that, giving them worksheets to do, I could tell from the results whether they understand or not.
>
> (NA 20/9/93 A)

Another way to know if her lesson was successful was by counting the number of students that could answer all the questions given to them. According to my observation notes, after giving some time for the students to answer the questions in their exercise books, NA would ask them to stop writing and start to solve the problems on the blackboard. After solving all the questions, NA always asked her students to put up their hands if they had got all the correct answers to all the problems, then those who had got one, two, three and so on, wrong answers. Eventually, she would normally say, "Today, only....of you

pass, the rest of you failed.". In the interview later on, after the observation, NA explained:

> (evaluate her lesson) Always from the way they answer all the exercises. If three-quarters of them could answer all the questions I gave them, I think I can consider that my lesson is successful. If not, I am not satisfied. I usually give them more exercises to practice, and revise again the following day. I want them to be sure.
>
> (NA 13/9/93 A)

As part of her teaching goals, NA had quite a low requirement of her students' getting good marks in their tests or examination. She mentioned in the interview that she "did not expect them to get high grades. Just the minimum pass, that's okay.' (NA 15/9/93 A)

The above quotation highlights NA's goals of teaching mathematics. Her goals suggest strongly her beliefs about school mathematics which, according to Ernest (1989), are inclined towards an instrumental view. It seems NA's beliefs about school mathematics and her teaching goals also affected her beliefs about what constitutes "successful" lessons.

Another characteristics of NA's beliefs which is highlighted by the quotation above is that persistent practice in doing exercises and the students working harder to answer those exercises would give the students the chance to pass the examination even if they were weak in mathematics. According to NA:

> When they have examination, they (the examiners) always follow the

> exercises from the workbook. That is why I always ask the students to practice doing the same type of questions. At least, this would give them the chance to pass the examination, even if only with minimum pass marks.
>
> (NA 21/9/93 B)

This highlights NA's goal of teaching mathematics briefly. No doubt that in the analysis these goals would influenced NA's mathematics teaching in the classroom. Therefore, in the following section, I will relate the teaching strategies that NA used for teaching mathematics in her classroom.

ii) NA's Teaching Practice - The teaching strategies that NA used in the classroom

NA's mathematics lessons always start with comments about the previous day's mathematics lesson. Throughout my observation most of the comments were quite negative, referring to the students' performance in their classwork or homework. For example, in my observation notes I wrote:

> 15/9/93 (7.30 am to 8.30 am)
>
> The teacher was telling the students about her disappointment with the students' performance the previous day. She went on to tell them always to remember the formula and how to do their long division. The teacher also reminded the students about the types of questions they will have to do in the examination.

After those comments she continued the lesson by giving her students drills. NA would test her students with some oral

questions based on the four operations. The test was mostly on speed and accuracy. According to NA these oral questions were used as "**warming up exercises**" (NA 21/9/93 B). Then the lesson continued by her asking the students if they had had any problems with the previous lesson, or by her referring to the questions that she found had caused most difficulty. These problems questions were then written on the blackboard and the teacher then start explaining, step by step, the procedure to the students of how to solve these questions. These steps were usually made up of the "standard working" showed in the examples in the textbooks or workbooks. For example, in one of the demonstrations of how to solve a mathematics word problem; I wrote the following procedure in my observation notes:

> 20/9/93 (7.30 am - 8.30 am)
>
> The question to be demonstrated by the teacher was "From a class 15 girls are taking part in the school dance. Each of them needs 1.5 m of ribbon. How many metres of ribbons do they need altogether?
>
> The teacher explained the procedure of how to solve the word problems, step by step. She explained; "You must look for what the question wants you to do. What is the clue. That is important. So here, what is the clue?" The students replied, in chorus, "Altogether". The teacher then said; "Then you must think what symbol to use. Do you understand? What sign to use to get the answer?" At the same time the teacher underlined "How many metres of ribbon do they need altogether?" She proceed to ask the students; "What sign to use?" The students replied "Plus". The teacher quickly corrected the students. "No, you must not use plus, read the question

again." The students read the question aloud. She attracted their attention to the word "each" in the question, and started writing on the blackboard:

1 girl needs 1.5 metres of ribbons
15 girls need 1.5 X 15 ribbons

= ....metres of ribbons.

The students listened to the teacher's explanation but, at times, they would respond to such questions as "What is the keyword in this question?" and "What sign are we going to use to solve it?", usually with one word, such as; "together" and "addition". The students went on to copy these "correct" solutions in their exercise books. The lesson then continued with the teacher writing the topic of the day's question on the blackboard asking the students to read the question to themselves, and then reading the question to the class. The teacher then demonstrated to the students how to solve the question. The procedure used was similar to the one used in the example shown above. This procedure was then repeated for the next two or three similar questions. At the end of the demonstration, the teacher then asked her students to copy he examples in their exercise books.

During the next stage of the lesson, the teacher would write a few questions on the blackboard, similar to the ones used for the demonstrations, and would ask a few students to come to the blackboard to answer them. The step by step procedure used by the students was similar to that used by the teacher in her examples. The correct solutions would be ticked to indicate that the answer was correct. The student who produced an incorrect answer would be asked

to try again or the teacher would call another student to come to the blackboard to try and answer the question. This was repeated until NA was satisfied that the students understood how to solve the problems relating to the day's topic. In the interview after one of the lessons, she said:

> (Why do you do corrections on the blackboard?) Because I want to know the result at once. What are the results? Can they understand or not? I always do this, at least I can correct them at once and explain the correct procedure. If I correct them and just return to the students, they just keep then in their bags and they will not see where they got it wrong.
>
> (NA 21/9/93 A)

Then came the final stage of the lesson when the teacher would provide the students with written work. The students would be asked to answer the questions in the workbooks or on the blackboard as their classwork. The students worked individually, and the teacher would go round the class to supervise them. She would helped the students she discovered making mistakes while solving their mathematical problems.

Besides doing the exercises for every mathematics lessons, NA also did some revision work with her students especially on Saturdays when the topic for the week came to an end, because, according to NA; "they need a lot of revision, a lot of drills and a lot of exercises." (NA 20/9/93 A). She went on to say:

> ...especially with revisions, I just want to see how they answer the questions, if they still remember what they have learnt. If they don't

> I can point out the mistakes straight away.
>
> (NA 13/9/93 A)

Obviously, judging from the teaching strategies used by NA, the blackboard was the most important part of her teaching repertoire. NA admitted in the interview that using a lot of blackboard work helped her students because, she said; this is very clear and easier for the students to understand." (NA 13/9/93 B) particularly when her students did not understand English very well. NA's classroom arrangement, too, was probably influenced by her dependency on the blackboard. She did not group her students into smaller groups; instead she preferred to let them sit in rows. She arranged her students in rows because she said she that wanted them:

> ...to concentrate on the blackboard. If I start to group the students, it will be difficult to get their full attention. They will not be looking at the blackboard.
>
> (NA 14/9/93 A)

and,

> Arranging the students in rows makes it easier to **keep an eye** on them.
>
> (NA 22/9/93 B)

iii) NA's relationship with her students in the mathematics classroom

As mentioned earlier, NA had preconceived ideas about her students' ability in school mathematics. She believed that her students would not be able to achieve high grades in

mathematics but "only the minimum" according to her. NA also branded her students as "lazy, don't bother to study." (NA 22/9/93 B), "have poor memory" (NA 20/9/93 A), "very poor in calculations, they still cannot do their sums mentally." (NA 16/9/93 A). She even accused the students in Brunei; "they have hard times in numbers and they cannot do even simple calculations." (NA 13/9/93 A)

The teacher's approach to teaching mathematics can be categorised as teacher-directed. NA's students played a very passive part in the classroom. The following incident was a familiar scene in NA's class when I was observing her. When she asked a few students to do some exercises on the blackboard, if one of the students did not get the correct answer, she would either ignore him/her and go on to ask another student to do the correction or she would ask the first student to do the exercises again and again without any attempt to help him/her. This made the student look embarrassed, especially with me sitting at the back of the class observing what was going on. I could see that NA purposely ignored the student, probably to ensure that he/she should try harder and pay more attention in the class. This was in line with the teacher's belief that students should put more effort in their mathematics learning if they want to get good grades. One of the ways was by observing closely the teacher's demonstration at the beginning of the lesson.

NA usually supervised her students while they were doing their classwork. She went round the class while the students were doing their work quietly in their own seats. If she noticed a student making a mistake, she would stand behind him/her for a while, then she would normally ask questions to help the student to get to the correct

procedures, such as. "What did the question ask you to do?", "What sign should you use?". Or, if she noticed that the student was using the correct procedure, but did not know how to proceed with the calculation, she would comment "You are so stupid, this is not the correct way to divide, do it again." The atmosphere was tense. During my observation period, none of the students asked the teacher for help even if they did not know how to solve the problems. The students would keep quiet, until the teacher came to their side to help them.

NA was quite a pleasant teacher, although she often gave unpleasant remarks to her students when they were not doing their work as she expected them to do. She believed, according to her "we have to be hard with them in order to help them to learn mathematics" (NA 13/9/93 A). She was "nice" to those students she considered to be doing their work. the students sensed this. I could tell, throughout my observations, that the students did not resent the teacher. They tried their best to please her. This was evident when the teacher asked the students, at the end of the lesson, "How many got all correct?" a question she often asked throughout my observations, and those students who had got all answers correct would eagerly put up their hand calling "teacher, teacher", trying to attract her attention. It was as if the students knew when they deserved to be scolded or praised by the teacher.

To understand the underlying beliefs the teacher had that could rationalise her teaching practice and relationship with her students, NA's beliefs about school mathematics, mathematics education and the students' learning were generated from the interviews with the teacher before and after every classroom observation. In the following section, the analysis made is based on the interview transcripts.

5.14 SECTION C: Data generated from the interview transcripts to highlight NA's beliefs

i) NA's assessment of her own ability and skills in school mathematics and mathematics teaching

NA admitted that she had no 'formal' training in teaching mathematics in primary schools except for the short course in Institute of Education before she was appointed as primary school teacher in Brunei. When asked if she was interested in attending more mathematics courses, she quickly replied:

> ...that is why I said, I am interested to attend the mathematics in-service courses, if I am given the chance.
>
> (NA 13/9/93 A)

NA explained to me that the mathematics teaching method that she used in her classroom was an "approach the I have learned (overseas) through observing my friends who were teaching mathematics." (NA 22/9/93 B)

NA expressed to me that she was not sure that the teaching method she used was the "correct" way to teach mathematics. She said:

> I don't know if I did correct. This is how we always teach in (overseas school where NA came from).You know a lot more than me. I don't know. I hope I am doing the correct thing.
>
> (NA 20/9/93 A)

But she admitted that she was just doing what her

colleagues (who were teaching secondary school in her country) were doing and also she was convinced that the other teachers in her school were teaching mathematics the same way. It seemed that NA was not familiar with the primary mathematics content; this was because, according to NA:

> This is the first time I am teaching mathematics, just three years. Before that I was teaching Science.
>
> (NA 14/9/93 B)

NA was further handicapped in her teaching because she could not speak Malay, the language that all the students in her class speak, therefore she found it difficult to communicate with her students.

She used the mathematics teaching methods which she had learned from other teachers in the schools. She had no definite idea about mathematics teaching in the primary school, except, according to her as long as my students can 'understand', that is important." and she went on to say "I am trying my best to make my students 'understand' my lesson" (NA 22/9/93 B)

ii) NA's attribution concerning the students' ability and motivation to learn mathematics

During the interview, I asked NA what worried her most when she was teaching mathematics. She quickly responded to me saying:

> Yes, you are right, I am always worried. To tell you the truth, every monthly test at least 10 fail. I don't know why. Maybe some of them

> are so lazy they don't bother to study, even though everyday you have to tell them to revise before coming to the classroom. Nobody, nobody did, they just ignore it.
>
> (NA 22/9/93 B)

from the extract above, it seems that NA put the blame on her students as the source of their own failure, at least, in the monthly tests. She attributed these failures to the students' lack of effort and ignoring the teacher's instruction to revise on their own. Most of the teacher's attributions and their effects have been mentioned earlier in the analysis. In this section, however, I will attempt to infer from the interview transcripts the teachers' attributions and the reasons for them. Most of the teacher's attributes were very negative, The most obvious ones were a direct result of the students' poor performance in mathematics.

There were a number of reasons, according to NA, for the students to have such poor performance in mathematics e.g. her students' ability to understand the questions and explanation in the classroom because they were weak in the English language. NA explained that she was teaching Primary 4, and this was the first year that the students had learnt mathematics (and other subjects) in English. before that, in Primary 1 to 3, they were learning mathematics (and other subjects) in Malay, the national language of Brunei Darussalam. Therefore, the students that she was teaching just had less than a year learning mathematics in English.

NA also believed that her students were "lazy, don't bother to study", and revise what they had learned again at home (NA 22/9/93 B):

> You know, these children, after every lesson, they just throw away their bags. They don't bother to look at their work again at home.
>
> (NA 15/9/93 A)

Therefore, to make sure that her students looked at their work, she insisted that all corrections have to be done on the blackboard, in front of the other students. She considered her students could not trusted to do their work on their own. She said, as quoted earlier:

> ...because when I correct it return to the students, they just keep the books in their bags and they will not see where they went wrong.
>
> (NA 21/9/93 B)

Another attribution was that her students were poor in calculation:

> ...they are always weak in division, I don't know, Chigu, I already drill them how to divide, I think it has something to do with their weakness with tables. Ah, yes, maybe that is the problem.
>
> (NA 14/9/93 A)

NA, however, knew how to motivate her students to learn mathematics. From my observations, I noticed that NA always started her lesson by asking students the results of their previous classwork. The students would eagerly put up their hands when the teacher asked "Who got all correct yesterday?". In fact everytime the teacher asked this type of question was the only time I noticed a display of enthusiasm by the students about the lesson. The prospect

of knowing who passed or failed in their classwork, according to NA provided; "an incentive and to motivate the students to learn..." (NA 14/9/93 A).

Another example of how NA motivated her students could be seen from the way she drew attention to the successful students. In her classroom there was a white board at the right-hand side of the classroom. Written on the white board was "Top Ten Students for August 1993), followed by a list of names of those ten students, in order, according to the marks they got for the monthly tests. When I asked NA why she put the list in the classroom, she explained that it was "an incentive, also to motivate the students to learn more. Next time they might find their names there... (NA 14/9/93 A)

Since the teacher had realised what motivated her students, she used "peer pressure" and a "sense of competitiveness" to influence her students to learn mathematics. She used the results of the classwork and monthly tests for that purpose. This seemed to be 'taken on' by her students, who, according to my observations, did prefer to compete with each other, probably for the teacher's approval. According to her attributes of her students' ability as described above, NA believed that learning, on the part of the students, was the product of effort, diligence, perseverance and self-discipline rather than ability.

I could not say, at this stage, whether this was a 'good' strategy to get the students to learn mathematics because this method could, I believe also lead to 'poor learning' in that students become dependent on the teacher for moving on to the next step or for approval. In other words, the

teacher always had to motivate them. However, NA seemed to think that this was the way to make her students learn mathematics. It seemed that NA and her students believed that teaching and learning mathematics was a serious endeavour.

There are a few terms that were used by NA which could be misleading if taken out of context of the teaching strategies used by NA in this study. For example, she used the term "**participating**" in her statements in the interview: "the students are **participating** in the lesson" (NA 15/9/93 B). In actual fact when she was asked to explain what she meant by "participating", she said that the word was used to explain that her students share their experiences with their friends when they do exercises on the blackboard. Another word (underlined in the analysis earlier) that she often used was "**understanding**". Again, when she was asked what she meant by "understanding", she explained that the term "**understanding**" was used when she considered that her students could do the exercises given to them.

iii) NA's beliefs about school mathematics and mathematics teaching

NA's beliefs about school mathematics were unelaborated and very specific. She believed that school mathematics was made up of isolated facts and figures that students did not need to think about how to solve them but only to recall the examples of how to solve these problems learned earlier. She considered that the mathematics we use "throughout our lives are only numbers" (NA 20/9/93 A). What the students needed to know was to figure out which of

the four operations to use to solve the mathematics problems. There was always the 'right' and the 'wrong' way to solve these problems. Obviously to the teacher and the students, the teacher held the knowledge of the 'right' way. She believed that the mathematical knowledge that students needed was how to solve these problems using the four operations, and to reproduce that knowledge again when answering questions in the class or during monthly tests and examination.

The methods of teaching that the teacher believed could help her students to pass the tests or the examination would certainly be considered worth using by the teacher. NA believed that, in examinations, the examiners always followed the exercises from the workbook. This could explain why she admitted that she stressed doing exercises and mostly used the exercises from the textbook;

> I like them (the students) to practice the same types of questions as in the examinations.
>
> (NA 21/9/93 B)

The teacher was more concerned with the products of her students' work than the process of learning. Test scores were important to her and the students themselves. This further motivated NA to use the teaching approach she used in her mathematics classroom.

NA compared her mathematics teaching in the classroom to 'Military training'. This was evident throughout the interviews. The metaphors that NA used to describe her mathematics teaching as 'Military training' were:

...they need a lot of revisions, a lot of **drills** and a lot of **exercises**.

(NA 20/9/93 A)

I already **drill** them how to divide...

(NA 14/9/93 A)

Arranging students in rows so that I can **keep an eye** on them...

(NA 22/9/93 B)

I started with **warming up exercises** and then I introduce them to the lesson.

(NA 21/9/93 B)

The metaphors that NA used to describe her mathematics teaching illustrate the important emphasis she put on good results in mathematics, that mathematics learning was a hard work and required lots of practice to be skilful. The teaching strategies she used also suggest that every student has the potential to pass the tests or examinations even if only with "minimum passes" if they are persistence in their work and given the right 'push forward' strategies by the teachers. These strategies include "drills" and "lots of practices in doing exercises".

5.15 SUMMARY

In the above sections, it could be considered that NA's teaching strategies could be categorised as traditional and

teacher-directed. Her approach was primarily didactic. It was clear that NA's teaching strategies were influenced mostly by her desire to help her students to learn the type of school mathematics which she considered to be important for her students to pass the monthly tests and examinations. This was confirmed by NA in Validation 1; "we really need lots and lots of exercises, from the textbooks and past question paper, from anywhere." NA knew that her students would not be able to do higher level thinking in mathematics, which required them to think for themselves. According to NA, her students could not understand the English language used to teach mathematics. Therefore, demonstrations using the blackboard was the solution as the students could see how the questions were solved even if they did not understand the explanation given by the teacher. This was again repeated by NA in Validation 2 statement 4.1 (see Appendix X). The teacher also believed that her students were weak in the four operations, which NA considered to be the most important components of learning mathematics. Therefore, drills in the four operations were also an important part of her mathematics teaching. NA substantiates this in Validation 2 statement 4.3 (see Appendix X). To reinforce what had been taught, NA also revised her lessons almost every Saturday, as soon as the topic of the week was covered. NA said that she did this because she believed that her students "have poor memory" (NA 20/9/93 A). Familiarising the students with the questions was also important, she felt, because; hopefully if they practice more, they will remember more easily." (NA 15/9/93 B). During the course of the interview, NA was asked what she considered to be "good mathematics teaching". She replied:

> ...just give yourself, just explain to them and be patient in explaining. Giving them some drills also, many drills.
>
> (NA 20/9/93 A)

These were this teacher's beliefs about "good teaching".

Although NA admitted that, despite her efforts in teaching her students mathematics, her students still do not do well in the monthly tests. But as mentioned earlier, NA believed that if the students persevered diligently, and put more effort in their work they would still have a chance of passing the tests or examination as the result of her teaching methods. I assumed that the reason why NA felt strongly about the teaching methods that she used as already quoted, was because:

> As long as my students can understand, that is important.
>
> (NA 22/9/93 B)

The word "understand" was referred to my NA to mean "capable of answering the questions given to them by the teacher".

The relationship between the teacher and her students emerged through her efforts to make her students work more and try harder. NA showed her impatience with students who, according to her, did not try hard enough. But, at the same time, she praised those who she considered were making more effort and pointed out that, through their efforts, were able to answer the questions correctly, on the blackboard or in their exercises books.

The students seemed to accept the teacher's method of teaching mathematics. This was probably because the students themselves put important emphasis on the examination and test results. This was obvious when they looked excited when they got all the answers correct in the classwork. The fact that students did not look at the teacher when she asked them questions and kept quiet in the classroom, not even asking her questions when they did not understand something, could be attributed to the students feeling that it was their fault for not trying hard enough to pay attention in the class, therefore, deserved to be ignored by the teacher or could be cultural behaviour expected from the children in Brunei.

5.16 CASE STUDY 4: Teacher MH

5.17 SECTION A: The teacher's profile

MH is in early thirties and had been teaching in this primary school, where I interviewed and observed her teaching mathematics, for the last 3 years. She also took part in my Phase 1 study in July 1992. MH obtained her BA (Primary Education) after graduating from UBD in 1989. She was a qualified primary school teacher before she joined the University.

The school where MH was teaching was in the State capital, within 10 Kilometres of the University. The building was new and, according to the Headteacher, the school had just started in operation in 1985. MH was teaching primary 5 when she took part in the Phase 2 study in September/October 1993. The classroom was on the first floor of a two-storeyed school building and very spacious compared to most classrooms in other primary schools. There were 31 students in her class, mostly girls. The class was grouped in 5 small groups; 3 groups of girls and 2 groups of boys. The segregation of the boys and the girls was normal practice in Brunei schools. At the back of the class was a group of four desks and chairs, which she used, as I noticed during the observation, as a place for the remediation of the students, who she considered needed more individual help than the others.

The classroom was pleasantly decorated with lots of the students' art work placed on the cupboard at the back of the class, as well as wall charts and displays on the walls. The students' exercise books were arranged neatly on her desk ready to be distributed back to them. MH was

dressed smartly in her "baju kurung" (Malay dress) and a matching head scarf.

MH's mathematics lessons were mostly the first two periods in the morning for 5 mornings a week. I usually arrived at the school (as arranged with MH earlier) at 7.00 am, and started interviewing her before her lessons started at 7.30 am. With permission from the Headteacher, MH was excused from the usual morning duties, such as supervising the students cleaning the compound of the school and gardening for two weeks so that I could conduct the interviews with her in the staffroom.

As soon as the bell rang signalling the start of the lesson, I would follow MH to her class. The students most of the time would be waiting for her. They would stand up and greeted us with "Good morning, Assalamulaikum, teachers" and then have morning prayers conducted by the class monitor. As soon as the students were seated, the teacher would take the register and then ask a student to take the register to the Headteacher's office. Only when these routine procedures had been conducted would the mathematics lessons start.

5.18 SECTION B: Data generated mainly from the observation notes to highlight MH's teaching practice in the classroom

i) MH's attempts to achieve her teaching goals

In order to provide some understanding of the teacher's teaching practice in the classroom, it makes sense to start by focusing on the teacher's teaching objectives. These

teaching objectives were partly from my observations of the teacher's teaching behaviours.

Most of the teaching objectives mentioned by MH were "instrumental", which could be achieved by memorising, recalling what had been learned and doing lots of practice. For example, one of MH's objectives mentioned in an interview transcript was:

> ...to enable the students to answer the questions and to recall what they have learned previously and to be able to apply what they have learned in their written exercises.
>
> (MH 5/10/93 B)

To evaluate the success of her lessons, the teacher would look for signs that her students could use the knowledge they had just learned during the lesson in answering the mathematics questions based on the lesson. This was done by giving the students exercises at the end of the lesson as seat work. In my observation notes, I wrote about the teacher's enthusiasm of giving the students lots of exercises for practising what they had learned earlier in the lesson:

> 6/10/93 (8.30 am - 9.30 am)
>
> ...when the student had finished answering the questions from the blackboard, the teacher gave them worksheets prepared earlier. The questions in the worksheets were similar to the examples given by the teacher in her lesson presentation.
>
> Further observation:

> The teacher seemed to be enthusiastic. She was "pushing" the students to finish their work quickly, so that she could asked them to do the questions in the workbook.

According to MH, giving the students a lot of questions based on the day's lesson not only helped the students to practice what they had learned but also provide her with the means to evaluate her lesson. This was mentioned by MH in the interview:

> Usually by looking at their written exercises. If they can answer most of the questions that means they understand the lesson. That is why I have to give exercises in every lesson. That is a way for me to evaluate my lesson as well as the students' understanding. Without this you cannot possibly tell.
>
> (MH 28/9/93 A)

MH admitted that she would be satisfied with her teaching when she knew her lesson had been successful. This she evaluated by looking at the results of her students' written exercises. For example, according to MH:

> When I saw their written work, mostly all of them have answered all the questions correctly, that mean's I have achieved my objective, that means I feel satisfied with my lesson.
>
> (MH 4/10/93 A)

MH's feeling of "satisfaction" about her teaching by looking at the result of her students' written work could lead to "false expectation" on the part of the teacher and

the students. It could also lead to the teacher depending on the type of teaching strategies that include doing a lot of exercises, and the students would consider that this was the type of school mathematics they needed to do in order to pass the examination. This was shown by the way MH used the term "**understand**" and "**understanding**" in her statement quoted above.

ii) MH's Teaching Practice - The teaching strategies that she used in the mathematics classroom

The following example of the teacher's mathematics lesson was taken from my observation notes, which gave an account of her lesson on "Time" (the conversion from minutes to seconds and vice versa):

> 5/10.93 (7,30 am - 8.30 am)
>
> The Lesson:
>
> The teacher started by writing the word "mathematics" on the blackboard.
>
> The teacher asked the students to keep quiet. Then she said; "Today we are going to change the subtopic. We are going to learn conversion of Time."
>
> Started the lesson by asking the students:
> How many minutes in 1 hour?
> How many seconds in 1 minutes? The students could answer both questions correctly. The teacher then write on the blackboard:
>
> 1 hour = 60 minutes
> 1 minutes = 60 seconds
>
> Using a big clockface, the teacher demonstrated infront of the class

the movement of the second hand. She explained to the students "1 circle is 60 seconds or 1 minutes. Half of the circle is 30 seconds. Quarter of the circle is 15 seconds"

She wrote down on the blackboard:

1 minute = 60 seconds
1/2 minute = 30 second
1/4 minute = 15 second

The teacher went on to demonstrate to the students how to solve problems using the above tables:

1/4 minute = 1/4 X 60 = 15 seconds.

Asked the students; "Which one is better for you, using the clockface or divide?"

The students answered in chorus; "Divide"

The teacher put the clockface away on the table. She then demonstrated another question: "1 3/4 minutes = ...seconds?"

The working that the teacher used was:

1 minute = 60 seconds
3/4 minutes = 3/4 X 60 = 45 seconds

Therefore 1 3/4 minutes = 60 + 45 seconds = 105 seconds.

The teacher then gave the students 5 questions similar to the examples.

For the remainder of the mathematics periods, MH would either write more questions on the blackboard and invite some students to do the exercises on the blackboard or ask the students to do the exercises from the workbook. When

she was asked why she asked the students to do the exercises on the blackboard, she replied:

> ...to make the students feel **confident**. To be able to show to other pupils that he could do the work, like a teacher, on the blackboard.
>
> (MH 29/9/93 A)

When they were doing their exercises, the students were not allowed to discuss the questions with their friends even though they were sitting in a group. When MH was asked why she warned the students by saying "no sharing" when they were doing their exercises, she said:

> Yes, no sharing. Because I want them to finish the exercises individually. I want to test them whether they can do the work or not.
>
> (MH 6/10/93 A)

Another reason given by MH was:

> ...the pupils feel **confident** when they answer the question individually.
>
> (MH 29/9/93 A)

MH was asked to explain what she meant by **confident**, she replied:

> You know, doing the work by themselves. they know they answered the questions on their own without help from their friends, so they must feel good if they got right answer. This will make them more confident.
>
> (MH 29/9/93 A)

The teacher would visit the groups and explain further if the students could not answer the questions. If there were time at the end of the lesson, the teacher would correct the students' work by asking a few students to show their work and share the answers with the other students. It was customary for the teacher to ask her students to exchange their books for correction. The teacher explained:

> After they have finished their work, I ask them to check their friends' work. After that I collect their books and check again.
>
> (MH 4/10/93 A)

On several occasions I noticed that while the whole class were busy doing their work, the teacher would call two or three students to the back of the class and help them with their problems associated with the previous day's lesson. The teacher had identified these students from their classwork of the previous day.

Sometimes MH would give her students revision work instead of new topic. The reason for doing the revision was because, according to MH:

> I always revise with my students the previous lesson to check if they can still remember their previous work. If I find out that they cannot remember, then I will go back to that lesson and revise again.
>
> (MH 5/10/93 B)

MH's teaching strategies did at the beginning of this lesson, incorporate the use of a teaching aid (the clockface). The use of this teaching aid was confined to

the demonstration of the formation of the table to be used later in the exercises, for example, "I circle is 60 seconds". The teaching aid was also used as a supplementary visual representation to the sketches on the blackboard. according to MH:

> ...I will introduce them using the clockface first and then I will draw the clockface on the blackboard.
>
> (MH 5/10/93 B)

The use of the teaching aid was, however, short-lived when the students and the teacher realised that they could do the exercises easier by calculation without the teaching aids. This was confirmed by MH:

> When I ask them, what method you find easier? All of them answered, using the symbols. I think they were right. So I let them use the symbols.
>
> (MH 28/9/93 A)

When probed further about why the students preferred to use the symbol instead of teaching aids, she replied:

> I think they are used to doing calculations using symbols, vertical addition or subtraction, students find that easier.
>
> (MH 28/9/93 A)

This episode proved further the teacher's beliefs about the role of teaching aids in promoting the students' mathematical learning and understanding.

The main part of MH's lesson consisted of demonstrating how

to solve mathematical problems, followed by doing exercises which were similar to the examples. The main objective was to practice what they had learned so that they could recognised the questions and be able to reproduce their working again when they were required to do so. According to MH:

> I think the students can do the exercises now. They already had some practice on the first day, yesterday. So they are getting better, because they have had practice from the first day.
>
> (MH 28/9/93 B)

MH was anxious about the examination, particularly the types of mathematics questions that would be asked in the examination. Therefore, she concentrated most of her teaching time on "doing the exercises" from the workbook and textbook. The teacher mentioned that the reason she emphasised doing the exercises was because:

> ...I have to give the students practice a lot in answering different types of questions they (the examiners) will give the students in the examination.
>
> (MH 5/10/93 A)

As mentioned earlier, in section A, MH's classroom was always arranged in 5 smaller groups. In the interview, the teacher said that she "like them to work in groups so that they can help each other". She went on to say:

> ...another reason is, like yesterday, I don't have enough clockfaces, one for every students, so they can share in a group. That will solve the problem.
>
> (MH 28/9/93 A)

In my observation, I noticed that besides "sharing" the teaching aids as mentioned by the teacher, I saw the students barely discussed the lesson with each other; they were just "sharing" the clockfaces with only one student doing the activity and the others just looking on. They focused their attention only on getting on with the exercises and getting the right answers. The students were well-disciplined, controlled, yet happily task-oriented.

iii) MH's relationship with her students in the mathematics classroom

The atmosphere in MH's classroom was quite pleasant. I felt comfortable, sitting at the back of the classroom observing and taking notes of what went on in the classroom. MH was very helpful and sympathetic towards her students, especially those she found to be weak in mathematics. As mentioned earlier, she would remember these students' problems and call them to the back of the class and help them while the rest of the class were doing their work.

The students were encouraged to asked the teacher if they had problems with their work. In my observation notes, I highlighted the effect of giving such encouragement on the students:

> 27/9/93 (7.30 am - 8.30 am)
>
> The teacher went round the class while the students were doing their work. Some of the students were calling the teacher for help in understanding the question in the workbook.
>
> Further observations:

> The teacher was quite enthusiastic in her work had good rapport with her students. The students seemed to be willing to ask the teacher some questions, especially for clarification on how to answer the question.

MH frequently praised her students when they deserved to be praised, and gave encouraging remarks when they did not get the correct answers. I made reference to this in my observation notes:

> 27/9/93 (7.30 am - 8,30 am)
>
> Whenever the students did the work on the blackboard correctly, the teacher gave encouraging remarks such as "That is good", "That is well done..." etc.
>
> For students who did not get the correct answers, she just asked them to go back to their seats and said, for example: Never mind just look at how (name of a student) solve the problem".

The teacher's main concern about mathematics teaching was to get her students to pass the examination. She tried her best to achieve this using the methods mentioned above. The students seemed to understand the teacher's efforts in the classroom to help them achieve good grades in mathematics by encouraging them to work hard and be well-disciplined. In one incident, MH described the type of discipline one of her students had when she was doing her own exercises even when the student were in groups. She said:

> I am surprised to see that my pupils, I am proud of them. When I asked them to do their work individually, they really do that. They don't share their answers. You

> see, when I checked their papers, some of the friends next to her give the right answer, But she did not get right answer. I feel she did not copy, she stick to her own answer.
>
> (MH 6/10/93 A)

MH believed that the teacher had a strong influence on the students learning mathematics. She believed that the ability of her students to answer the mathematics questions depended on the teacher. She said:

> I am sure they will be able to answer the questions but only after I teach them the topic. They can do it because, maybe, I teach them.
>
> (MH 4/10/93 B)

5.19 SECTION C: Data generated from the interview transcripts to highlight MH's beliefs

i) MH's assessment of her own ability and skills in school mathematics and mathematics teaching

When MH was asked to express her feeling about teaching mathematics, she replied:

> I like mathematics actually. So far I didn't have any problems with teaching it, except for my students. They always forget what they learned.
>
> (MH 28/9/10 A)

This was an interesting revelation made by MH which I believed explained a lot of things about MH's beliefs about school mathematics and mathematics teaching and her

classroom practices. I could see that, during the two weeks' observations, MH was enthusiastic when she was teaching mathematics and this could probably explain why she said "of course I like mathematics, because it is my interest. I feel very happy when I teach mathematics." (MH 6/10/934 A)

"Like mathematics", does not necessarily mean that she was knowledgeable about the subject. There were a few incidents, which I observed, indicating that MH was confused when she was teaching the students how to solve mathematics exercises, especially when using the "symbols: as she referred to earlier. For example; in my observation notes, I wrote:

> 29/9/93 (7.30 am - 8.30 am)
>
> The teacher was still teaching the topic "Time" under subtopic "Before and After".
>
> The teacher begins with using two sketches of the clockface on the blackboard. One marked "Before" and the other one marked "After"
>
> The teacher starts to give examples using the diagrams. For example:
> "The time is now 10.30 am, what time will it be 20 minutes after that?"
>
> The teacher drew the hands of the clockface marked "Before" showing 10.30 and then counted 20 minutes. She then marked 10.50 on the clock marked "After"
>
> After giving several examples, using the clockfaces, the teacher moved on using vertical addition or subtraction.

> One of the question was difficult for the students: "The time now is 1.15 pm. 20 minute before that was...?"
>
> The teacher explained it on the blackboard using the vertical subtraction.
>
> ```
> Hr.    Min.
> 1       15
>
>     -   20
> ----------
>         55
> ----------
> ```
>
> The teacher realised that the answer was wrong, because I saw her hesitating, but she did not know why she was wrong. So she gave the answer as above with out any further attempt to correct the mistakes and try to explain the correct procedure to the students. She seemed confused.

In the interviews MH also indicated that she was not sure any teaching methods other than the ones she used in the class. Her reasons for using these teaching strategies as mention earlier were, according to MH:

> I am not sure of other teaching methods. Many teachers use this method, that means, I think I also use it. Because, sometimes it is successful. Maybe there are other methods, but for the time being I think this method seemed successful. I think I only know this.
>
> (MH 28/9/93 B)

When MH was asked to explain further, why she and the other teacher as referred to use the particular teaching strategies. She went on to explain:

> I think because of the students. Students are so used to this type of teaching from Primary 1, so if we change now, most probably they will not be able to follow. So to make it easier for the students, so they are not confused, I think we better use this method.
>
> (MH 28/9/93 B)

MH was not sure if she was allowed to change her teaching strategy by deviating from her lesson notes, which showed the usual teaching practice and the practice used by other teachers. For example, when I asked her in the interview if she had made any attempt to change her teaching methods, she admitted:

> Yes, always. like I said before I start my lesson with revision of the previous lesson, then I will continue with introducing the new lesson. Sometimes, if I find out that they cannot remember, then I will go back to that lesson. I will not continue my lesson plan. Is that wrong, Madam? I always do that but I also afraid if the Inspector see me and check my lesson note, he will penalise me.
>
> (MH 5/10/93 B)

The "change" that MH referred to was not a major change from her usual teaching practice. Sometimes she felt that she could not follow the procedure that was written in her lesson notes. As we could see, MH was not feeling comfortable even to the extent of deviating from the planned lesson. It is interesting to speculate what would happen if her whole teaching approach were changed from the

routine teacher's demonstration with further examples on the blackboard followed by doing lots of exercises.

MH was willing to attend in-service mathematics courses. This should indicate that she was interested in teaching mathematics, just as she said in the interview. I asked MH if she would like to attend more in-service courses in mathematics, she replied enthusiastically:

> Of course I like to. If I can to further my study for teaching mathematics, especially courses CS (Curriculum Studies in Mathematics). I want to do that again.
>
> (MH 6/10/93 A)

ii) MH's attribution concerning her students' ability and motivation to learn mathematics

The teacher's attribution of her students which she shared with the other teachers in this study and that seemed to have most effect on her teaching strategy, was that the students "got very poor memory" (MH 27/9/93 B). She said:

> ...the students, sometimes they remember at that time. Tomorrow they will forget. That is why I give them revision at the end of the week.
>
> (MH 4/10/93 B).

In order to help her students to remember what they had been taught, the teacher used strategies that required them to repeat what they had learned, particularly in doing revision. This teacher mentioned that she needed to revise her previous lessons before she started the lesson of the day. This was confirmed by MH:

> ...before I start with my lesson, I always revise with my students the previous lesson to check if they can still remember their previous work. If I find that they cannot remember, then I will go back to that lesson and revise again.
>
> (MH 5/10/93 B)

MH also believed that her students were "poor in calculations" (MH 27/9/93 B). To be able to do calculations in the four operations was essential to the students' success in answering the mathematics question because, according to MH, the students preferred to "use symbols" in doing mathematics, as mentioned earlier, and therefore the students used a lot of "calculation using symbols, vertical addition or subtraction." (MH 28/9/93 A) when they were solving mathematics problems. In one of the lessons on "Time" about converting from seconds to minutes, MH commented on the students' weakness in calculation, which could affect their performance in solving mathematics problems:

> ...when it is conversion from seconds to minutes they find some difficulty because they cannot...they could not do how to convert seconds to minutes, because it involves divide.
>
> (MH 5/10/93 A)

When asked what her most difficult task in teaching mathematics was, MH referred to the great effort she had to make in order to make her students understand mathematics. This was attributed to the students' lack of skills and memory, especially with word problems. She clearly stated this in the interview:

> I think to make them understand, especially word problem. This is the biggest headache for us teachers. They are already poor in calculation and they also got poor memory...
>
> (MH 27/9/93 B)

Besides the attributes mentioned above, MH also shared the belief with other teachers that the Bilingual system of education in Brunei made it more difficult for the teachers to teach and the students to learn mathematics. According to MH, teaching mathematics in a second language, which in English, and expecting "the students to understand the language was asking too much from the students" (MH 27/9/93 B). During my observation, not only did I notice that the students found it difficult to understand the language, but the teacher was not well versed with the language either. In my observation notes, I commented on this:

> 27/9/93 (7.30 am - 8,30 am)
>
> Further observations:
>
> The teacher's spoken English was not very good and also not clear. She made mistakes in tenses as well as sentence structure. The students did not seemed to find this a problem, since they were concentrating only on what was written on the blackboard.

The teacher always praised her students' performance, when it was good. This could show that she cared about her students' reactions to her teaching. She expressed her feelings to me during one of the series of interviews I had with her:

> I was satisfied. Mostly all of them did the clockfaces. Some not so good, but the others were good. The students seemed to be happy and excited. So I think that was a good lesson. Yes, I was satisfied.
>
> (MH 27/9/93)

iii) MH's beliefs about school mathematics and mathematics teaching

In the interviews, the teacher did not mention her beliefs about school mathematics and mathematics teaching. These beliefs were reflected quite often in her teaching practice. For example, her choice of the teaching method used to teach mathematics as mentioned earlier, her comments about the examination and her use of some of the terms normally associated with mathematics education.

Judging from the teaching methods used by the teacher, mentioned earlier in Section B, there was a clear indication that MH believed that school mathematics is made up of questions and word problems that could be solved using any one of the four operations.

The way that MH made some references to her mathematics teaching indicated clearly her beliefs about it. MH considered her mathematics teaching to be a form of "**training**" where sayings such as "practice makes perfect" and "familiarity" with the activities applied. The following are some of the examples of the metaphors that were used by MH to describe her mathematics teaching:

> Only a few problems some students find difficult. But I am going to **coach** them in the next lesson.
>
> (MH 5/10/93 A)

> Some of the can, they remember what they did before and try to **remember** and they could do it.
>
> (MH 6/10/93 A)

> Students are **so used** to this type of teaching from Primary 1. If we change now, most probably they will not be able to **follow**.
>
> (MH 28/9/93 B)

> I think they are **used** to do these calculations using symbols. Students usually find it easier.
>
> (MH 28/9/93 A)

MH also made some comments about the examination system that is still used in Brunei. When she was asked what she thought of the examination system in Brunei, she said; "Okay, I think it is still the right way to evaluate the students." (MH 6/10/93 B). Almost the same remarks were made by MH regarding the tests she usually gave the students at the end of each topic. When she was asked why it was important for her to give the tests at the end of every topic she taught, she replied:

> ...because I want to know whether they have learned or they have not learned. If I found out that they cannot do the questions, what sub-topics they make mistakes, I will do it again after I covered all the topics in the scheme.
>
> (MH 6/10/93 B)

Another indication of teachers' beliefs about mathematics

and mathematics teaching and their teaching practice was MH usage of some mathematical terms. For example, she mentioned quite often the terms **practical teaching** to describe her mathematics teaching. When she was asked what she meant by **practical teaching**, she explained:

> ...because they use their own clockfaces instead of using the blackboard. At least at the beginning of the lesson I was holding a real thing. I think I was using **practical teaching**.
>
> (MH 28/9/93 A)

From this quote, it seems that the teacher believed that as long as she and her students were holding "real" objects in the classroom, she was conducting **practical teaching**. The teacher did not make any reference to the learning and interactions that occurred as a result of using the teaching aids.

5.20 SUMMARY

There are certain beliefs about mathematics and mathematics teaching and teaching practices associated with MH which stand out and deserved to be mentioned again. This is not to say that these beliefs were unique to MH since the last 3 case studies in this Chapter had proven that they had similar beliefs and practices. The overall impression that I had about MH was that she liked mathematics and enjoyed mathematics teaching, as she mentioned in the case study and as was reflected in her teaching as well. her enthusiasm had an effect on her students in that they too seemed to be enjoying the mathematics lessons.

Previously, MH was quoted in the case study as saying:

> I like mathematics actually. So far I did not have any problems with teaching it, except for my students, they always forget what they learned.
>
> (MH 28/9/93 A)

My impressions, based on my observations and doing the analysis for the case study, were that MH believed that the problems associated with her mathematics teaching mainly stemmed from the students themselves. This was revealed in the attributes she gave her students in the case study. attributes such as "they are lazy to revise their lessons" and "students are shy and they seldom ask their teacher when they are confused" were mentioned again by MH in Validation 1.

First and foremost, MH agreed about the examinations. according to her they are "still the right way to evaluate the students" (MH 6/10/93). Therefore, evaluation played an important part in her teaching. She had to know if her teaching was successful or not, and if her students learned something from the mathematics lessons. According to MH this was done by:

> ...looking at their written exercises. If they can do most questions that means they understand...that is why I have to give exercises in every mathematics lessons. One way for me to evaluate my lesson as well...Without this you cannot possibly tell.
>
> (MH 27/9/93 A)

MH supplemented her evaluation by giving her students tests at the end of every topic. When asked why it was important for her to conduct the tests at regular intervals she replied; "because I want to know if they have learned or they have not learned." (MH 6/10/93 B)

It came as no surprise to me, since she was so keen on examination, testing and evaluation, that MH believed that school mathematics was made up of word problems to be translated into numbers and solved using the four operations. For example, even telling time, as mentioned in the case study, was solved using vertical addition and subtraction.

MH's teaching objectives were achievable by simply memorising, recalling and applying the facts that had been learnt, particularly from the teacher's demonstration and examples of how to solve these mathematical problems. One other factor that had to be resolved to ensure the students' passing the mathematics tests and the examination was to 'cover" the scheme of work.

The rest of the teacher's beliefs and teaching practice centred around the smooth running of the mathematics lessons in order that all the topics in the scheme of work were covered and the students could reproduce the facts that they learned again in the examination. She substantiated this beliefs in Validation 2 statement 2.3 (see Appendix X) For example, MH believed that "practice makes perfect". The more her students practised doing the exercises, the better chance they had of retaining the knowledge until the examination. Therefore, from the observation, most of her teaching times were devoted to just that, doing written exercises.

The factors that MH believed could affect her mathematics teaching and the students' learning would be the attributions she had concerning her students. For example, she considered her students "forgetful", "have poor memory" and weak in calculation". Therefore, she believed they had to be given lots of practice and revision to help them become more skilful in calculations and remember what they had learned. Besides, she attributed their problems to the Bilingual System of Education in Brunei because, since the students had to be taught mathematics in English, they did not understand the questions, particularly word problems in mathematics. To try to overcome such problems, the teacher had to use "clues" and "keywords".

MH was satisfied with her lesson when her students could do all the mathematics exercises given to them. She also said that such an achievement made her students "happy and excited" (MH 27/9/93 A). Although I observed that MH used teaching aids, namely the clockfaces in her teaching, the true objective of teaching using teaching aids, namely to make the students understand the underlying concepts of the topic taught, was not present. Teaching aids (clockfaces) were used to demonstrate how to tell the time as suggested in the workbooks and were quickly replaced by "symbols" because the latter were preferred by the students and the teacher. Hence, group work was used sharing the smaller number of clockfaces amongst the students.

The teaching methods that MH used were according to her, well-established among the teachers and the students in Brunei Darussalam. Again, she substantiates this in the Validation 2 statement 2.2 (see Appendix X) when she said that she dared not change the procedure in case she could be reprimand by the school Inspector and that the students

were used to such teaching methods so that changing them now would disadvantage the students.

My impression of MH's mathematics teaching in the classroom was that it was in line with her beliefs about mathematics and her beliefs about mathematics teaching. Her beliefs about mathematics and mathematics teaching might have been misguided or reinterpreted because she used terms such as **confident**, **practical work** and **understand** in mathematical contexts other than those they were normally used. Taking these beliefs into consideration, MH was playing her role as best as she could possibly have done. her students seemed to enjoy her lessons, and she was well aware of their problems and would be there helping them when she was needed. MH seemed to be determine to get her students good grades in the examination.

CHAPTER 6

SYNTHESIS OF FINDINGS OF PHASE 1 AND 2

6.1 Introduction

The criteria that were used to select the 4 teachers for Phase 2 from the 12 teachers who took part in Phase 1 study were based on their beliefs about school mathematics and their beliefs about mathematics teaching which had been revealed in the structured interviews I conducted in July to September 1992. The analysis in Phase 1 had demonstrated that there were slight differences between teachers' beliefs. Phase 2 study was conducted from July to October 1993. I decided to select the 4 teachers according to as broad a range of beliefs and practices between the teachers as possible. Therefore, I examined their attitudes to school mathematics and mathematics teaching because I wanted to see if these differences were more evident through their teaching practices in Phase 2.

In Phase 1, ND and HM had shown slightly more positive attitudes towards school mathematics and seemed to be more flexible in their teaching when compared to the other teachers in the study. In contrast NA and MH was slightly more negative and appeared less flexible in their espoused teaching practice. In Phase 2, however, as the case studies in Chapter 5 show, these teachers showed very slight differences in their choice and use of teaching strategies and the results did not quite reflect the predictions based on the Phase 1 results; NA and ND were quite rigid in their teaching: they both arranged their students in rows and did not use teaching aids, while HM and MH were portrayed as teachers who both enjoyed teaching mathematics and also used group work and teaching aids.

All the teachers with the exception of ND were graduate teachers. While two of the graduates had followed Education courses in UBD, the third had graduated overseas. ND had received her Certificate of Education from Sultan Hassanal Bolkiah Institute of education in Brunei. The length of their teaching experiences differed slightly among them, they ranged from 3 years to 10 years.

6.2 The Relationships Between Teachers' Beliefs in Phase 1 and their Teaching Practices in Phase 2

Oprea and Stonewater (1987) indicate that relationship between the beliefs system and the teachers' practice was far from simple. Studies such as Brown (1986) suggest that inconsistency between teachers' expressed beliefs about school mathematics, their mathematics teaching and classroom actions might arise because there are possible conflicts that exist between a teacher's conception of mathematics and his/her perceptions of students' needs and interests. Studies such as Cooney, 1985; Desforges & Cockburn, 1987, suggest that there may be disparity between espoused and enacted models of teaching and learning mathematics. Reporting on their research with first school mathematics teachers, Deforges and Cockburn (1987) found that the condition of teaching severely limited the teachers' classroom practice:

> We are convinced - in the light of our research - that the major barriers to the establishment of higher-order skills in the classrooms lay not in the practice of teaching but in the conditions of teaching.
>
> (Desforges & Cockburn, 1987, p 143).

In the following section, I will attempt to highlight the relationships between the instructional practices of the 4 teachers I observed in Phase 2 and their espoused beliefs in Phase 1 and some part of Phase 2. And if there were relationships, were they consistent or inconsistent?

Later in the Chapter I will attempt to summarised the roles of the teachers and the students in teaching and learning mathematics in Brunei Primary schools.

6.2.1 The consistencies and inconsistencies of the teachers' beliefs mentioned in Phase 1 and their instructional practices in Phase 2

The Phase 1 study had shown there were consistencies within the teachers' beliefs about school mathematics and their beliefs about mathematics teaching (see Chapter 3). In Phase 2, referring to the Case Studies in Chapter 5, the teachers' beliefs and practices were also consistent. What seemed to be missing from the teachers' comments in the interviews in Phase 2 but were mentioned by them in the interviews in Phase 1 was the effect of some of the factors that the teachers referred to that would inhibit their teaching practices. These are external factors, such as the mathematics curriculum, scheme of work, the textbooks and workbooks and the perceived lack of supervision. This might be due to the shift in focus of my questions, from mathematics education in Phase 1 to what I observed the teachers teaching in Phase 2. Nonetheless, these factors were present in their practices. For example, the teachers still followed topics stated in the scheme of work and workbook very closely. These obstacles and enablers that the teachers mentioned mattered less to them when they were

actually teaching because then they were less overtly conscious of them.

What seemed to be important to the teachers in Phase 2 were the outcomes associated with their teaching behaviour. Their teaching intent was geared towards helping their students to pass the examinations. As mentioned by one of the teachers; "at the end we have to rush because of the examination. The examination is important...." (MH 27/9/93 B). The teachers' perceived certain outcomes regarding their behaviour and the likelihood that these outcomes would occur as major influences on their beliefs about their teaching behaviours in the classrooms. This was confirmed by the teachers when all the 4 teachers agreed with statement 2.1 in Validation 2 (see Appendix X):

> I am still not sure the new method of teaching mathematics I learned from the teacher training works for us. Because I said, the most important thing is that they can answer the questions in the examination.

Phase 2 confirmed that all the four teachers' beliefs about school mathematics seemed to be that school mathematics is mostly exercises made up of numbers and word problems that could be solved using the four operations; as mentioned in one of the interviews after a lesson, one of the teachers said; "the more they do the more they will understand" (HM 19/8/93 B).

These numbers and word problems were governed by certain fixed ways to solve them and conforming to certain rules and procedures (algorithms, or "working" , as it is known among Brunei teachers). One such example was in one of the

case studies, when one of the teachers was teaching the topic "Average". The teacher asked her students, "....what do you usually do when the question asks you to find the average?", the students replied "add and divide." (Observation note 31/8/93 ND).

As mentioned earlier, the teachers' beliefs about mathematics teaching also showed few signs of variations. Their teaching strategies seemed to begin in similar ways regardless of the topics they were teaching. This was confirmed by all 4 teachers who agreed with Statement 1.4 in Validation 2 (see Appendix X);

> I always start the lesson discussing and revising the past lesson by writing some of the questions that most of the students could not answer on the blackboard, and after that I will give them worksheets to do individually.
>
> (Statement 1.4 Validation 2)

The different classes they taught at the time of the interview (Phase 1) and the observation (Phase 2) did not affect their beliefs and their instructional teaching procedures, according to HM and ND in Validation 1. They admitted that there is not much difference between teaching Primary 5 and Primary 6; "The same. except I give more questions and exercises now to familiarise the students with the examination.' (HM, Validation 1). This was echoed by ND who was, at the time of observation, teaching Primary 6:

> If I am teaching primary 4 or 5, I would use the same method of teaching, maybe doing fewer exercises.
>
> (ND, Validation 1)

If there were any inconsistencies within the same teacher that were observable in Phase 2 and were not mentioned in Phase 1, these were probably due to the types of questions asked during the interview in Phase 1. These observable inconsistencies should be related to the teacher's interpersonal relationship with his/her students. In Phase 1, the teachers mentioned certain rules and procedures that the students have to comply with if they are to be good at mathematics, such as memorising multiplication tables, doing lots of exercises, being attentive in the classrooms and well disciplined. These were repeated by the teachers in the interviews in Phase 2. It seemed that learning mathematics is a very difficult task for the students to play.

In Phase 2, however, through my observations, I was sentimentally touched by the sincere caring of these teachers towards their students. They showed interest in their students' learning. Their actions and teaching behaviours were geared towards giving their students the opportunities to increase their learning more, for example in choosing the "right" method of teaching. In validation 2, all the 4 teachers agreed with statement 2.2:

> I use the method of teaching that is used by most of the teachers so that the students will not be confused. Furthermore, this teaching method is sometimes successful in making the students able to answer questions given to them.
>
> (Validation 2 Statement 2.2)

The teachers' sense of caring for their students, has to be seen as relational and reciprocal (Gilligan, 1982). They knew that their students depended on them for their

education and that this caring relationship had to be nurtured (Noddings, 1984). The teachers' teaching methods, such as giving students lots of practice in doing exercises, were reflections of their concerned about the poor quality of their students' performance in the examination. This was mentioned in an interview with NA: sentiments which seemed to be repeated by the other teachers throughout this study:

> I am worried. To tell you the truth, every monthly test at least 10 fail. I don't know why. Maybe some of them are so lazy, they don't bother to study even though everyday you have to tell them to revise the past lessons...Nobody, they just ignore it. Maybe some of them are just lazy.
>
> (NA 22/9/93 B)

They also mentioned that they spent considerable time and effort looking for exercises as part of their lesson plans. They mentioned these occasional frustrations, particularly with students who they considered "weak in multiplication tables", "poor in calculations", "poor understanding of English" and "forgetful". The teachers seemed to agree that their students do not have the basic skills to perform autonomous and group learning activities.

The dilemma of teaching mathematics to these types of students compelled the teachers to be "drill sergeants" which they believed they had to be. ND compared her mathematics teaching with "going to war" (ND Q 20 p 4). By September, she went on to say:

> We have only ***drilling, drilling, drilling,*** that mean's they have to base these on what they have learned before.
>
> (ND 1/9/93 A)

HM was using the same metaphor as he explained to me why he used "drills" as his teaching method;

> I had to teach that one (Time). I was already far behind the other classes. This is where I feel the students need ***drills, drills,*** like old methods used by other teachers.
>
> (HM 18/8/93 A)

The above metaphors and attributions seemed to play a very important part in the teachers' choices of teaching strategies. Although it seemed that the 4 teachers had expressed a strong sense of responsibility for their students' learning and of caring for their students, there were differences in the way they demonstrated their relationships with their students in the classrooms. For example, as mentioned in the case studies, two teachers (HM and MH) were using teaching aids while two (NA and ND) were not, although, essentially, their teaching objectives and teaching practices were quite similar. They were all moving in the same direction, which was teaching for the sake of the monthly tests or examination. However, from my observations, the use of the teaching aids and arranging the students in groups did provide a more conducive and comfortable teaching/learning atmosphere, with students allowed to talk to each other, although on limited topics. There was also movement in the classroom, with students being allowed to move from one group to another. For example, I made the following observation with reference to HM's classroom (this quotation had been used earlier in the case study.):

23/8/1993: Further observations:

1. The students seemed to be happy and were enjoying the lesson when they were using the clock faces to tell the Time.

3. Another strong characteristic of the class was that the students were lively, allowed to talk and discuss with their friends, and were allowed to move around in the class. The teacher seemed to have a good rapport with his students. They called him to their groups when they had problems with their work.

Sitting in rows gave the impression that learning, particularly in mathematics, was a "regimented" exercises both for the teachers and the students. For example, from my observation of NA's lesson on 14/9/1993, I wrote:

14/9/1993: Further observations:

1. The atmosphere in the classroom was tense. None of the students asked the teacher any questions. I could not be sure whether the students learned anything from the lesson, as I did not get any feedback from the students.

2. The teacher was quite impatient with the students who could not do the exercises. This was quite obvious by her actions such as throwing the pencil after helping the student writing down the working in his exercise book, pushing a student's head, raising her voice etc.

It has to be mentioned that when the teacher seemed to be "impatient" with her students when they could not do their

work, such behaviour was not because NA did not care for her students. On the contrary, it might be because she was anxious about her students' achievement in mathematics. For example, NA expressed her worries that her students would fail in the monthly tests (NA 22/9/93 B) and she said;

> I feel bad, I cannot achieve my objectives this time. I have my objectives but unfortunately the result of yesterday's work was not good. I feel bad.
>
> (NA 14/9/1993 A)

As mentioned earlier, it could be possible that NA's and ND's approaches to teaching were influenced by the classes they taught. NA was teaching Primary 4, the first year the students are learning mathematics in English, and ND was teaching Primary 6, the last year of the primary level and the students would be sitting for their PCE examination in October that year.

This study has highlighted the teachers' roles showing that the old concept of the "school-teacher" as a more or less authoritarian purveyor of accepted knowledge and skills is very much alive in Brunei Darussalam. The mathematics syllabus is carefully defined centrally in the form of a scheme of work, even to the extent of sub-topics to be taught at a specific date using specific pages in the textbooks and workbook. The contrast between two classes, those of HM and MH with the two other classes of ND and NA, however insignificant, are not trivial. Both MH and HM seemed to be more approachable and sympathetic than ND and NA.

Discipline was never a problem in the classes that I

observed. The students seemed to know the teachers expected them to behave and, in most cases, they did. The routine of mathematics lessons also helped the students know what was expected of them. The teachers' teaching was not only about teaching mathematics, but also about the process of making sure each student knew what to do and how to do whatever was being assigned to them. The teachers did not overtly ask the students watch properly what they were doing on the blackboard or to learn the new skills. The students seemed to know that this was an essential part of their learning, and that if they paid attention and worked hard, they would learn. This was quoted by one of the teachers:

> Doing a lot of exercises motivates the students. Doing activity, they don't consider that as learning seriously. They consider that is for small children.
>
> (ND 1/9/93 B)

In the Validation 2, all the teachers also agreed with Statement 3.4 which referred to students' motivation of learning mathematics:

> The students like to show off to their friends when they get a correct answer. They want to know who passes or fails in the classwork. This is an incentive and motivation for the students to learn more.
>
> (Validation 2 Statement 3.4)

The scene I observed in one mathematics classroom, further supports the statement I made earlier about the students' acceptance of their role in the classroom. It was typical of what I observed happening in most of these teachers'

mathematics lessons, the students wanting to do more than what the teachers gave them to do:

> 2/9/1993: Further observations
>
> 1. The teacher just wrote 6 questions based on the word problems on the blackboard, the students answering these questions within 15 minutes. There was about 10 minutes left of the lesson before break time. The students were asking the teacher to give them more classwork. The teacher wrote another 4 questions on the blackboard.

Teachers are persons with whom students have already established a relationship, whom they recognise as being able to perform well the task to be learned and for whom they have respect. Teachers in this study expressed how important they believed it was for them to gain the respect of their students. One of the ways to do that was to be seen to be knowledgeable about the subject. For example MH said:

> Especially infront of our students, we have to be able to do those exercises ourselves, otherwise the students would say that we are not fit to be teachers.
>
> (MH 18/8/1993 B)

Similarly, in Validation 2, all the teachers agreed with statement 3.2:

> I think the teacher is a very strong influence on the pupils' learning. If the children respect the teacher, they will learn more from him.

The teachers' belief that to be seen to be knowledgeable would gain the students' respect might have an impact on their beliefs about mathematics teaching and instructional practices. Putting the emphasis on doing lots of exercises might be a way of gaining an appearance of control of the teaching and learning situation in the classroom.

The conclusion I had come to after Phase 1 was that teachers who took part in this study held similar beliefs about mathematics, and about mathematics teaching. Even though I had selected four teachers who seemed to vary in their beliefs about mathematics in Phase 1 (as described in the beginning of this chapter) in Phase 2 their beliefs and teaching practices seemed much closer and the relationship between these beliefs and their instructional practices seemed to be consistent.

However, the relationships between the teachers and the pupils which developed during the mathematics teaching, the caring attitude and the strong sense of responsibility that teachers showed towards their students, and the students' acceptance of their roles were only evident in Phase 2. In this aspect there were some differences between the teachers. In addition I would like to emphasise the extra effort made by HM and MH, such as using group work and using teaching aids. However trivial this effort may have seemed, it was a starting point towards achieving a better students/teacher relationship and a more comfortable atmosphere in the classrooms.

6.2.2 The espoused beliefs the teachers expressed in Phase 1 which was exhibited by the teachers in Phase 2

Teachers' beliefs are thought to play a critical role in predicting their thinking, motivation, intentions and behaviours. Bandura (1977) presents a social learning theory called "self efficacy" designed to explain human behaviour in terms of a "reciprocal interaction between cognitive, behavioural, and environmental determinants" (p vii). Research on self efficacy which has emerged from the field of social psychology has the potential for explaining teachers' beliefs about mathematics and mathematics teaching and their relationship to their instructional practice in this study.

Efficacy, a social psychological theory of behaviour studied by Bandura (1977, 1982) has two components, self efficacy and outcome expectancy. Self efficacy is "the conviction that one successfully executes the behaviour required to produce the outcomes" (Bandura, 1977, p. 79). Outcome expectancy is defined as "a person's estimate that a given behaviour will lead to a certain outcome" (Bandura, 1977, p. 79). Bandura proposed that people's actions are guided on the basis of observed consequences and on the beliefs they create for themselves. In education, self-efficacy has generally been defined as the belief that one's teaching ability is related to positive changes in students' behaviours and achievement levels, and outcome expectancy is the belief that any teacher, in spite of all other factors, can bring about positive student behaviour and achievement (Dembo & Gibson, 1985).

Research on self-efficacy has demonstrated the potential for explaining some of the phenomena that I observed in the mathematics classrooms. Teachers' beliefs that their teaching will lead to their students being able to do mathematics, and about their own effectiveness in

influencing students' motivation and achievement seemed to influence their teaching practice. Typical teaching behaviour observed in this study includes reliance on textbooks and workbook, a lecture style of teaching, and doing lots of seat work.

In this study, as already mentioned many times, all teachers believed that giving the chance for their students to do lots of exercises is the way to help them to pass the examination. This was mentioned by HM who echoed what the other teachers believed:

> Like word problems, for me, the more they do the more they will understand.
>
> (HM 19/8/1993 B)

Besides giving lots of exercises, which the teachers seemed to do in all the classes I observed, the teachers also seemed to try to cover all the topics in the scheme of work and do all the exercises in the workbook in order to give their students a chance of passing the examination. For example, one of the teachers cited the importance of following the workbook in his mathematics lessons (as in the following quotation already cited in the case studies in Chapter 5):

> What is said in the workbook, we have to follow. Because most questions in the examination, I have checked, follow the workbook.
>
> (HM 17/8/1993 B)

Teachers' beliefs about the mathematics examination formats also influenced their teaching strategies. Familiarising

their students with examination questions was a statement repeated throughout the interviews, both in Phase 1 and Phase 2. A teacher was asked, after a lesson, why she gave her students a lot of exercises. She replied (as already quoted in Chapter 5):

> I gave my students lots of exercises. We want to familiarise the students with these questions, especially from past question papers. Hopefully if they practice more, they will remember more.
>
> (NA 15/9/1993 A)

Research findings on efficacy in teacher education suggest that behaviours, levels of persistence at a task, and degree of risk taking and innovation are related to degrees of efficacy (Ashton & Webb, 1986). Highly efficacious teachers were more likely to use student-centred, inquiry based teaching strategies, while teachers with a low sense of efficacy were more likely to use teacher directed teaching strategies. It can be inferred that self efficacy in this study may be related to the teachers' general unwillingness to change their teaching methods although at least two of the teachers in this study, had twice attended the mathematics courses in UBD as pre-service students.

The findings in this study support the notion that in restructuring mathematics education in Primary schools in Brunei, we need to be more aware of the teachers' beliefs about school mathematics and mathematics teaching. If changes in the teachers' practices in the mathematics classroom can be executed successfully, future research

efforts should focus on understanding how teachers' beliefs can facilitate rather than limit these changes.

In the following two sections, I summarise the above sections in terms of teachers' and students' roles in teaching and learning mathematics in primary schools in Brunei Darussalam. Most of what is to be highlighted, has been mentioned in the last sections of this Chapter. Some repetition is inevitable.

6.3 The roles of the teachers and the students in teaching and learning mathematics

6.3.1 The teachers' roles in teaching mathematics as perceived from the interview transcripts and classroom observations

It seemed from my observations and the interviews, all the teachers regarded teaching and learning as two separate but related sets of responsibility. One set of responsibilities was to be given to the students, viz. the acquisition of the skills they needed in mathematics lessons. The other was the teachers' responsibility to teach and give as much practice to the students as they possibly could and to cover the scheme of work. Each set of responsibility was separate but complementary to one another. If each of these parties carried out their responsibilities to the maximum potential, then teaching and learning mathematics in Brunei would be successful.

The teachers' roles and responsibilities in teaching mathematics are:

a) The teachers had to cover all the topics in the

syllabus. They saw this as their responsibility to their students. Therefore they needed to follow the scheme of work very closely. Failure to do so could make the teachers anxious that they would be blamed if the students were not able to answer some questions in the monthly tests or in the examinations.

b) The teachers had to provide chances for the students to practice trying all the possible types of questions that were expected in these tests and examinations i.e., the questions from the workbooks, textbooks and past question papers. Any diversion from these types of questions would be of disadvantage to the students. Therefore, the teachers had to look for exercises similar to those given in the workbooks.

c) To supplement these exercises, and to make sure that the students remembered how to solve these exercises the teachers had to give them regular tests and revision practice particularly immediately a topic had been covered.

d) Teachers needed to use teaching methods that were widely used. Changing teaching methods might disadvantage the students who were used to certain methods of teaching mathematics from Primary 1.

e) The teachers believed that it was very important for them to be respected by their students. Therefore, it was important for the teachers to be seen by the students as the "main source of knowledge and skills". This statement was further supported by all four teachers (see Validation 2, Statement 3.1.)

6.3.2 The students' roles in learning mathematics, as perceived by the teachers

The students that I observed seemed to play a very passive role in the mathematics classroom. Also, they were required to develop certain skills if they were to be able to understand the lessons. The following abilities seemed to be expected from the students in learning mathematics:

a) Being good in multiplication tables: better still, being able to memorise, and recall these tables when required in solving mathematics problems.

b) Being able to pay full attention to the teachers when these teachers explained and demonstrated how to solve mathematics problems on the blackboard.

c) Being able to practice doing the exercises, especially the ones from the textbook, workbooks and the past question papers.

d) Being skilful in doing the four operations: this seemed to be the passport for the students to get good grades in mathematics.

e) Individually taking responsibility for learning mathematics, for doing their own work and for not interfering with others doing their work.

6.4 Conclusion

The findings that have been highlighted in this Chapter described the teachers' beliefs about school mathematics

and their beliefs about mathematics teaching. The instructional practices of the four teachers in this study were similar. I seemed to have achieved the aim of my Phase 2 study. In addition, there are a few, very relevant findings that this study highlighted and that were not included in the aims of Phase 1 and Phase 2, but which could be used as a basis to provide a better understanding of the scenario of mathematics teaching and learning in Brunei. This has been discussed in the earlier part of this Chapter.

What had influenced the teachers' beliefs and instructional practices seemed to be the teachers' low self efficacy as well as the accepted teachers' and students' roles in teaching and learning mathematics. This study showed that Brunei teachers have atypical ideas of children and of teaching compared to teachers in developed countries. This will be explore further in the next chapter.

Because of the teachers' beliefs and self efficacy, these may be the most difficult areas to bring about changes in teachers' teaching. Further research is needed to examine factors relating to the successes and failures of the efforts made in order to ascertain clues for successful future pre-service and in-service mathematics education in Brunei Darussalam. My wish is that, the findings in this study which relate to the teachers' self efficacy about teaching and learning mathematics, and the differences between HM and MH classes compared to ND and NA classes should be used for directing future research in Brunei Darussalam.

CHAPTER 7

PRIMARY MATHEMATICS EDUCATION WITHIN THE EDUCATION SYSTEM AND THE CULTURAL CONTEXT OF BRUNEI DARUSSALAM

7.1 Introduction

Berlak and Berlak (1981) have argued that there has sometimes been an oversimplified attempt to explain behaviour directly in relation to beliefs and attitudes and values. They argue that social contexts are more complex than this. For example, about the classroom they observed, they mentioned:

> Sometimes teachers' pattern of resolution seemed to be consciously chosen, deliberate efforts to put social and educational values into practice, though these choices were always qualified by situational constraints, some of which teachers recognised and discussed openly; at other times teachers patterns seemed almost totally mindless, sheer habit, or formed by cultural and social experiences and forces, or by internal needs of which they were but dimly aware.
>
> (Berlak & Berlak, 1981 pp 108)

The culture in which the schools are contained, the Education policy and the specific situational knowledge all contribute to the unselfconscious routinised habits of teachers' teaching and students' learning. The culture has its own language, its own knowledge, its own vocabulary. There are particular orientations, towards the schools and towards the students, which contribute to the mathematics education. This is the issue I wish to discuss in this Chapter.

7.2 Mathematics education in the context of the education system in Brunei

In Chapter 1, the mathematical context of the study, including the status of mathematics in Primary schools, and the students' achievements in Mathematics in Brunei Darussalam have been explained briefly. In this section I will attempt to relate the findings of the study in Phase 1 and Phase 2 to the system of education in Brunei: in particular, the role of the system of education in influencing what goes on in the mathematics classroom.

It has been stated in this study that the system of education in Brunei Darussalam is highly bureaucratic and centralised. The Ministry of Education in Brunei Darussalam is the policy-making body and is responsible for all policy decisions. If the Ministry decides to introduce curriculum changes, the schools are "expected" to implement them and not much resistance is shown by teachers. A good example is the "Bilingual System" which was introduced and implemented in 1985.

The System of education in Brunei is also examination-oriented and has become an end in itself because at various stages the pupils have undergone selection, been placed, been promoted and have graduated after various examinations. The objectives of the system from this point of view must be to pass examinations and the content of education must be such that the students could be examined in it. Consciously or unconsciously, those who determine the course of study must ask themselves not what the

students should learn but on what they can be examined. So long as schools are primarily concerned with the task of getting students to pass a series of examination from one level to the next, there could be little room for teachers to attempt to deal with other concerns.

How much the state policy makers, namely those within from the Curriculum Development Department, influence what really must be taught in the schools needs now to be made explicit. I will outline the strong hold of these policy makers on mathematics education in Brunei schools (both Primary and Secondary).

The objectives of teaching mathematics in primary schools, prepared by the Curriculum Development Department indicate the type of mathematics these policy makers expect the students to learn and the teachers to teach. Two of these objectives are:

> 3.2 To help pupils to acquire the skill to understand and master tables 2 to 10.
>
> 3.3 To help pupils to master the four basic operations, namely addition, subtraction, multiplication and division.
>
> (Mathematics Syllabus, Upper Primary Schools, Darjah IV - VI p 2)

These aims certainly influence teachers' decisions about the content and decisions on what teaching strategies are appropriate for teaching mathematics. The Curriculum Development Department in Brunei has control over the

following areas in mathematics (and other subjects in the curriculum):

a) The amount of time to be allocated to mathematics on the timetable (see Appendix III)

b) The topics to be taught as listed in centralised mathematics syllabus.

c) Who will be taught which topics as given in the scheme of works.

d) When and for how long each topic will be taught as given in the scheme of work.

e) How well the topics are to be learned as assessed in the monthly tests and examinations.

7.2.1 The possible effect of the mathematics syllabus and scheme of work on the teachers' teaching of mathematics

Porter (1989) found that the content provided in many elementary mathematics classrooms was unconnected and superficial, with most topics being exposed only rather than with any development of understanding. This was found to be true in the case of the mathematics content found in the scheme of work for primary mathematics in Brunei Darussalam where not only is the content scattered and superficial, but also rigidly constructed, day to day and topic by topic. For example, as one of the teachers directed my attention to the scheme of work:

> See, topic 13 is Time, Date: 20th September - 25 September; Mathematics Workbooks 5B; pp 181 - 190. Demonstration: drawing the

> hands of the clock to show time. So today I have to use the workbook at this page.
>
> (MH 22/9/1993 B).

The teachers mentioned that they were following the scheme of work very closely, for the sake of the examination. Therefore, the content of the scheme of work is a reflection of what really went on in the classroom. In Validation 2, all teachers agreed with statement 2.3 (see Appendix X) that if the students failed in the examination, and it was found that the teacher failed to cover all the topics listed in the scheme than he/she would be blamed.

This explains why teachers in this study criticised the scheme of work in terms of the number of topics which are included in it. For example one of the teachers in this study said:

> Too many topics to teach and at the end we have to rush because of the examination. Examination is important.
>
> (NA 14/9/1993 A)

The teachers also mentioned the over-prescribed scheme of work as the reason why they were unable to change their teaching methods. This was referred to by the teachers, both in Phase 1 and Phase 2, as echoed by MH:

> I want to maintain too many topics in the scheme of work. If too many topics, it is difficult for us to introduce other methods of teaching to the children.
>
> (MH Q 19 p 6)

It was not so much the number of the topics in the scheme that really caused anxiety among the teachers, but the rigid way the topics were allocated in the scheme of work. Every topic has its time scale in the scheme. Failure of the teachers to teach certain topics within the time scale not only lead to the teachers having to "rush" through the topics but also to use teaching methods that involved a lot of "drilling".

7.2.2 The possible effect of the centralised examination system on the teachers' mathematics teaching

The students' achievement in Brunei Darussalam is usually measured by their performance in the monthly tests and examination. Performance in this study is interpreted as the ability of students to respond to the questions in the PCE examination which is taken by them at the end of their primary schooling in Brunei Darussalam. Success in examinations is crucial for the continuous progression from one level of education to the next. The examination results, particularly the Standardised examination at the end of Primary 3 (at the age of 8 to 9 years old) and the PCE examination at the end of Primary 6 (at the age of 11 to 12 years old), are to compare school performance throughout the country. This is evident from the way the results of these examinations, school by school and district by district, are published in table form, and made available to the Ministry of Education and the schools. These results are also published in the local newspaper. The PCE examination now aims to measure the pupils' attainment in five subjects (before 1993, in four subjects), English, Malay, Mathematics, General studies, and, recently since 1993, Science. It is basically an

assessment device designed to promote pupils to Secondary schools and is also used as a basis for streaming. This particularly applies to those who perform very well and selected to continue their Secondary Education in the elite Science College in the State capital.

The importance of the examinations and other types of assessment in developing countries, Brunei Darussalam included, is stressed at every level right from the very top in the Education system. In fact the system itself functions on the basis of the examination results.

Brunei Darussalam's Bilingual system originated from Singapore's Bilingual system. In Singapore, the primary school pupils are streamed after they take their Primary three examination (Singapore Yearbook, 1985). Those who perform well are promoted to the Normal Bilingual schools while others either go to the Extended Bilingual or Monolingual schools. The difference between those schools is that the pupils in the Normal Bilingual schools have the normal 6 years of Primary Education while pupils in the Extended Bilingual or Monolingual schools are given 7 years of Primary Education. The pupils in both the Normal and the Extended Bilingual schools sit for their Primary School Leaving Examination (PSLE), which is the equivalent of the PCE in Brunei, a selective examination.

In Brunei Darussalam, although the divisions in the Primary schools do not exist as in Singapore, there are other indications that highlight the importance of the examination for other purposes such as to select students who are to take up science subjects and go on to the elite Science College and also to select good students for higher education.

Pg. Mariam, the Director of the Curriculum Development Department, Ministry of Education, Brunei Darussalam referred to the pupils' achievements in the PCE examination as measured by their performance in the school examination and other assessment procedures:

> Success in the examination is crucial for the continuous progression from one level to the next. The examination results, particularly the Standardised test at the end of the Primary 3 and PCE examination at the end of Primary 6 have been used to compare school performance throughout the State. The importance placed in these examinations has to certain extent, distorted the learning process by subjecting pupils to pre-examination practice and drills. It has been indicated that overall school performance in Standardised Tests and PCE examinations have been satisfactory. However, it was reported that some pupils have problems expressing answers in their own words or in conducting practical work individually or in groups without supervision. Thus to what extent the pupils have actually learned or achieved in Primary school has not been reflected fully from the examination results.
>
> (Pg. Mariam, 1991/1992, P 56).

The above quotation reflects what was really happening in the primary mathematics classrooms I observed in this study. When the results of the examination have important consequences, such as promotion to the next level, and there is pressure on the students to perform well in them the teachers will teach to the test.

Although the teachers feel that they are pressurised by the examinations, the very reason why examinations are conducted, i.e. as a selection procedure for students to be promoted to the next level of his/her education means that the teachers support the existing method of assessment. As mentioned by one of the teachers:

> This is the only way we can see which pupils should be promoted to Secondary schools, so we think it is okay.
>
> (RA Q 32 p 5)

Mathematics is regarded as one of the most prestigious subjects in the school curriculum in Brunei. This had been mentioned in Chapter 1 of this study. The effect of the high status of the subject, according to Apple, is that:

> High-status knowledge appears to be discrete knowledge. It has... identifiable content and...stable structure that are both teachable and, what is critically important, testable.
>
> (Apple, 1990, p 38)

"Identifiable content" in the case of mathematics, is, according to the teachers in this study, the content of the workbook. The structure of the mathematics examination questions is very familiar to the teachers and has not changed for many years. In the context of Brunei Darussalam, the study by Lopez-Real, Veloo and Maawiah (1992), based on PCE results, suggests that most of the low facility questions (of 40% and less) fall into the Concept/knowledge or Application categories. The results of their study can be regarded significant to the type of test

referred to by Shepard (1989) who said that students were asked to practice on "remarkably similar" items as those in the pass examinations or tests.

Concerning the National Curriculum in the United Kingdom the Report of the Task Group on Assessment and Testing (TGAT 1987) suggests that national assessment should be criterion-referenced; formative, moderated, and progressive but the Report goes on to say:

> No country appears to have a national assessment system which is well developed in relation to formative purposes and to a framework of progression.
>
> (Para 12)

This is all the more so in countries such as Brunei Darussalam where the Ministry of Education has not taken any initiatives to evaluate or to conduct any research into the effects of the Primary Certificate of Education examination (Lopez-Real, Veloo, Maawiah, 1992). As long as no evaluation is carried out on the present PCE examination it is, therefore, acceptable to the schools, parents and the Ministry of Education that teachers should teach for the sake of the examination. Consequently, the results will affect the teachers methods of teaching in the classroom.

7.2.3 The effect of the Bilingual system of Education on mathematics education

The Bilingual system of Education in Brunei Darussalam which was introduced in Brunei Darussalam in 1985, has been mentioned briefly in Chapter 1 of this study. The introduction of the English as the medium of instruction

from Primary 4 onwards could be considered yet as another form of selection. It is worth noting that under the new Bilingual System of Education, academic subjects to be taught in English (see Appendices II and III). Presumably this will select those students who are able to pursue these subjects at a higher institution of learning where the medium of instruction is English. Usually these institutions are overseas such as in the United Kingdom, Australia and Singapore.

Prior to 1985, English medium schools had always been the choice of parents and their children alike. In Government schools, the medium of Malay was considered to be suitable for those who did not pass the Primary 4 selection examinations and therefore, could not qualify for places in English medium schools. This procedure of selection made those who stayed in the Malay medium schools feel inferior to students in the English medium schools who were considered to be "the cream".

For more affluent Bruneians, the alternative was and still is the Mission and Private schools, where English is used from Pre-school to Form 5. This meant parents paying substantial school fees. Moreover the majority of the teachers in the Mission and Private schools are not qualified teachers. The introduction of the Bilingual system in Brunei in 1985 is considered by Bruneians as a progressive step in the right direction.

Education problems associated with the Bilingual system have never been brought into political issues in Brunei Darussalam. On a similar note, The former Prime Minister of Singapore, Lee Kuan Yew, as reported in the Straits Time (2 August, 1982), described Brunei and Singapore as "fragments

of mankind" when compared to large countries like India or Indonesia, which could strive to be self-contained. He said small countries like Singapore and Brunei:

> had no alternative but to plug into the established international network, through the use of English.
>
> (Lee Kuan Yew, 2 August 1982)

At the same time, he stated that bilingualism "should be promoted to prevent a gap forming between an English-educated elite and the rest of the population."

The exposure to the English language of primary 4 , 5 and 6 students, in Brunei primary schools, is very limited. Language is a powerful instrument for learning. Therefore there is a need to investigate how to make use of concepts which children have developed in their first language when they start learning in their second language (or sometimes their third language if they have other native languages besides the standard Malay use in the school). An important point is that, ideally, the teacher should interact verbally with their students in the classroom. The question is whether this could permit the transfer of concepts learned in one language into another where the medium of instruction is English and when this is first time the students encounter the English language use in the mathematics classroom without support from outside.

Through my observations in this study, I noticed that there were very limited interactions between the teachers and the students. The students seldom asked questions, even if they found the lesson to be difficult. The teachers'

believed that some of the students were shy and quiet, and that this attribute hindered them from seeking help from the teachers when they had problems understanding mathematics. All teachers agreed with Statement 5.2 in Validation 2 that stated:

> Many of these students really need help. If they are confused about how to do the exercises they keep quiet. Some of them will call the teacher, but some are very shy.
>
> (Validation 2 Statement 5.2)

The findings of this study unfortunately cannot be used to identify the main reason why, for example, there were a lack of interactional verbal communication between teachers and their pupils. In most of the classrooms I observed, teachers did most of the talking mainly by demonstrating and giving examples on the blackboard, and on some occasions, incorporating reminders and warnings for students to work harder or do their homeworks.

What was clear from the observations was that teachers tended to avoid the problems of teaching mathematics, either due to their own lack of mathematics content knowledge and pedagogical content knowledge, or to the limited English language proficiency of both teachers and students.

One of the methods mostly cited by the teachers throughout this study was working through using the blackboard. As mentioned in one Statement in Validation 2 and agreed by all the four teachers:

> Students do not understand the English language. So I use a lot of blackboard work so that even if they don't understand, the students can see, not only hear.
>
> (Validation 2 Statement 4.1)

Another method of teaching that teachers used, which seemed to be the result of the Bilingual system, was the use of "key words" and "clues" in teaching the students how to find the operations needed to solve mathematical problems. In the following quote, it seemed that using "key words" and "clues" was a teaching strategy that teachers have to use to enable students to do the exercises due to the students' limited understanding of the English language used in the word problems:

> All the word problems are in English, Children don't understand what the questions are. So this is the problem. Sometimes we used keywords. What to do? Like together means add, difference means subtract. We have to use that rather than they cannot answer the questions.
>
> (NA Q 36 p 9)

Due to the similarity of the questions to those used in the examinations, as mentioned earlier, the teachers were confident of their method of teaching mathematics using "clues" and "keywords". For example, when asked "What will happen if the mathematics exercise has no clues ?" ND replied; "I don't worry, the questions always have clues in them. So I just follow." (ND 1/9/1993 B).

So far in this Chapter, I have tried to relate the

teachers' beliefs about mathematics teaching to the Education system in Brunei Darussalam. This study suggested that much of what was going on in mathematics classrooms, for example, the role of the examination system and the Bilingual system was related to the Education System.

In the next section of this Chapter, I will highlight some episodes relating to the culture of the society of Brunei Darussalam that I observed in the mathematics classrooms.

7.3 The effects of the culture in Brunei Darussalam on mathematics teaching and learning in Primary schools

According to Hamilton (1993):

> Cultural connections (of study on beliefs) have rarely been examined.
>
> (pg 87)

Hamilton went on to say:

> While the study of beliefs is important to the understandings that influence teachers' actions and choices in the classroom, it should be studied within a framework that recognises the influence of culture.
>
> (1993, p 87)

The most obvious place to start the discussion of the influence of culture on mathematics education is on teacher/pupils relationship in the classroom. In the study, it has already been mentioned that students seemed to be passive recipients of mathematics knowledge, while teachers were teaching. In Chapter 6, it was also mentioned that

there seemed to be certain roles for the teachers and the students to play in classrooms in Brunei, and that these roles were acceptable to both parties. In this section, I will discuss the reason why these roles are acceptable in Brunei.

In developing countries such as Brunei a teacher is regarded as the role model in the classroom and as such he/she has to be respected. Respect for authority, particularly for teachers and elders, is part of the culture. This has led to a style of teaching and learning, and an image of the educated man centred on the teacher or "guru" (an influential or revered teacher). For example, included as one of the "Aims of Primary Education" in Brunei is:

> 1. At this stage, besides reinforcing basic skills, instruction will be of a formal nature and will include the teaching of spiritual and moral themes.
>
> (The Education System of Negara Brunei Darussalam, 1985: 11-12)

The relationship between the "guru" and pupils is hierarchical, based on the teacher's knowledge. Respect and gratitude are expected from the students. The teachers in this study mentioned that it was important for them to be "knowledgeable" in front of their students.

In extreme cases the children are expected to respect and obey without question. In fact according to the Quran (the Muslim Holy book), the first word sent down from God to Prophet Muhammad was "Read"

> Read, in the name of thy Lord who createth. Createth man from clot. Read and thy Lord is the most bountenous.
>
> (Yusuf (1977, p 1761 - 1762)

Among the four teachers that I observed, two of them arranged their classes in rows, the other two in groups. I described earlier that the atmosphere in the classes which was in groups were more friendly and conducive to learning. Nevertheless, the teaching methods that teachers used were similar. They accorded with the cultural beliefs that knowledge comes from the teachers and it is the teachers' responsibility to set the agenda for the students to learn, while the students are responsible for doing their own work. These teachers encouraged competition among the students through public demonstration, such as asking the students to do exercises on the blackboard in front of the other students and evaluating their own work by, for example putting up their hands if they got all the correct answers.

From the stand point of the social norms and culture of Brunei society, such practice by the teachers is not thought to encourage "individuality" among the children. In this study, even when the students were sitting in rows they were not allowed to discuss doing their work with other students. It was only through close observations that I realised that the arrangement of the classroom had a great deal of significance. For example, the teacher almost always started a lesson by walking to the front of the classroom and standing in front of the blackboard. It was, as if the teacher was signalling to the students, "let's do this (teaching and learning) together". Automatically, all

eyes were on the teacher, paying close attention to whatever he/she was doing, from using teaching aids to doing demonstrations on the blackboard. Every student in the class knew that they had to "participate" in the lesson, either by responding to the teacher's questions, individually or in groups (chorus answers), or by doing exercises on the blackboard. They were waiting for the teacher to call them by their names to do an activity. Even a shy, or a quiet student had his/her chance to "participate" in the lesson.

Every student was kept under the teacher's watchful eyes. NA, when she was asked why she did not group her students mentioned; " I can keep an eye on them, especially the weak ones, and also it is easy for them to pay attention on the blackboard" (NA 22/9/1993 B). The teachers encouraged the students to "participate" in the lessons by asking them to do the exercises on the blackboard in front of the other students and this they said, "motivated" their students to learn mathematics. When the teacher asked questions, either the students answered in chorus, or they waved their hands to attract the teacher's attention, and hand raising was one way for them to participate. Being acknowledged and having their names called by the teacher made the students seemed happy.

The teaching method of asking the students to do exercises on the blackboard at the front of the classroom is commonly used by mathematics teachers in developing countries. In Indonesia, Warli (1990), a lecturer, did research on the impact of such a method on 40 first grade students. The sample was selected by stratum, which was based on the students' mathematics score in the final examination in primary schools. Prior to the teaching and learning process

in class, a pre-test was given to the experimental and control groups. Except for asking students in the experimental group to do exercises on the blackboard at the front of the classroom, all the methods used including the evaluation, were the same for both groups. The result of the post-test showed that students who are always asked to do exercises and solve problems on the blackboard at the front of the classroom do better in mathematics than those who are never asked to. Therefore the study suggests that asking students to solve problems on the blackboard at the front of the classroom seems to have a positive impact on the ability of students in mathematics.

The point I would to make here is that teaching and learning mathematics in Brunei should be looked at in the context of the culture where the teaching and learning take place. Interviewing the teachers in Phase 1 to highlight their beliefs about school mathematics and their beliefs about mathematics teaching was not enough as a basis for making judgements about their mathematics teaching. Observing them teaching in the classroom, analysing their beliefs and instructional practices in the light of the context of where teaching and learning took place seemed to suggest that what the teachers were doing was justifiable in the sense of carrying out their responsibilities and acknowledging their accountability for their students' learning within the perceived limits they mentioned in Phase 1. This might explain why the teachers' beliefs and teaching practices are consistent and similar across the four teachers.

The findings of this study show that there is little that teacher education could do in terms of factors relating to the system of education and the culture of Brunei

Darusalam, such the examination system and the Bilingual system that exist in Brunei now. However, field experiences and mathematics education courses still have a great influence on the development of future teachers and in-service teachers in understanding of how to teach mathematics.

Further discussion relating to mathematics education and teaching in Primary schools in Brunei arises as a result of the interviews I held with the mathematics education lecturers from UBD and the school inspectors from the Ministry of Education. The analysis of these interviews would constitute Phase 3 of the study which will be discussed in the next Chapter.

CHAPTER 8

PHASE 3:

Mathematics Teaching in Primary Schools In Brunei: Perspectives of the Mathematics Education Lecturers and the School Inspectors

8.1 Introduction

After briefly analysing the data for Phase 2, in February 1995, I went back to Brunei to interview the mathematics education lecturers in UBD and the school inspectors in the Ministry of Education as a basis for Phase 3 of my study. These education officers knew the teachers participating in my study and had direct access to them.

The main task of the mathematics education lecturers in UBD, is to conduct lectures to pre-service student teachers with the aims of preparing them to teach mathematics in primary and secondary schools. These lecturers are also involved in giving in-service mathematics courses to the serving teachers in schools. As part of their role as lecturers, they are required to supervise pre-service teachers doing practical teaching in schools. Degree programmes consist of two sessions of teaching practice, each comprising six weeks, while Certificate programmes consist of three teaching practices, namely Teaching practice I, II & III, for 2 weeks, 4 weeks and 6 weeks respectively. As part of the Faculty of Education's aim to "actively promote its expertise within the community" (Handbook, Faculty of Education 1994/1995 p2) the lecturers are also involved with the Ministry of education in monitoring the progress of teachers in the schools.

The responsibility of checking professional standards of

school administrators and teachers is carried out by school inspectors. Their tasks include checking the efficiency and effectiveness of the education system, the teachers, the condition of schools, classrooms, other facilities, the implementation of the school syllabus, the school administration etc. The specialist school inspectors, such as the ones that I interviewed in this study, have an additional role in that they have to conduct workshops for teachers throughout the State. The school inspectorate is however short of staff, as in the case of this study, there are only two mathematics specialist inspectors for the whole Brunei State .

The idea of including the lecturers and the inspectors as a part of this study is in line with Webb et al's. suggestion that researchers are likely to exhibit greater confidence in their findings when these are derived from more than one method of investigation. They referred to "triangulation of instrument" (Webb et al. 1966). However, for my study, I will treat Phase 3 as a "triangulation of data" in which a different source of data is used to illuminate the findings of the two Phases analysed earlier. Just to remind the readers, the aim of Phase 3 was, as stated in Chapter 2:

To illuminate the findings of the two phases of the study earlier by examining these in relation to the perceptions and views held by the mathematics education lecturers and the school inspectors in Brunei Darussalam

All mathematics lecturers in UBD took part in the interviews with the exception of a lecturer who was on maternity leave at the time I conducted the interviews. I had the opportunity of interviewing both school inspectors in charge of mathematics education in Brunei. The interviews were conducted in their offices and each

took approximately 1 hour. The interviews I had with the lecturers and the school inspectors were semi-structured, in the sense that they were free to express their views and perceptions about mathematics education in Brunei. But I had also prepared some questions earlier, which I used to guide the lecturers and the inspectors back to the agenda I wished to be covered (see Appendices VII and VIII).

The data from the interview transcripts provided me with rich, varied and detailed accounts of events concerning mathematics education that are happening in Brunei Darussalam, both in the schools and in UBD. I have focused only on some of the Phase 3 data, viz. that which was relevant to the findings from Phase 1 and 2. The analysis begins by classifying the data according to the following sections:

Section A: describing the lecturers' and the inspectors' ideal mathematics classrooms and comparing this with the teachers' mathematics classrooms and teaching as I observed in Phase 2.

Section B: presenting the scenarios of mathematics teaching in Primary schools in Brunei as perceived and observed by the lecturers and the inspectors, and relating them to the teachers' mathematics teaching as I observed in Phase 2.

Section C: highlighting the lecturers' and the inspectors' perceptions and views about teachers' attitudes, preferences and outlooks to mathematics teaching, and relating these to the teachers' beliefs about mathematics teaching as I found in Phases 1 and 2.

Section D: highlighting the perceptions of the lecturers and school inspectors about the adequacy and the relevancy of the support that the teachers received when they were teaching mathematics and relating them to the teachers' perceptions on similar issues as found in Phases 1 and 2 .

8.2 SECTION A: The mathematics education lecturers' and the school inspectors' perceptions of an ideal mathematics classroom

To gain an insight into the lecturers' and the inspectors' perceptions about their ideal mathematics classrooms, I asked them; "What is your ideal primary mathematics classroom?". This question was aimed to compare the lecturers' and the inspectors' ideal mathematics classroom with the mathematics classrooms that I observed in Phase 2.

In the analysis, I began to realise that the lecturers and the school inspectors interpreted my question about "ideal mathematics classroom" differently. The lecturers responded by talking about their ideal mathematics lessons. Whereas the school inspectors mentioned their ideal classroom, the set up of the classroom, the displays on the walls, etc. Although the lecturers expressed their views in different ways, these views seemed to indicate similar ideas that, in mathematics classroom, children should be allowed to be involved actively in the learning process, and verbal interactions between teachers and students should be encouraged. Here are two extracts from the interview transcripts:

> ...in the past when we were students, many, many years ago, it was literally the chalk and talks approach and the teacher dominated the classroom, and we were, of course very passive listeners.

> Whereas today, these ideas have totally gone and the active involvement of the students is important. So we have the activity method, problem-solving method... These should be encouraged in the schools.
>
> (Lecturer 8/3/95 9.00 am)

> What I am trying to suggest to these teachers is problem solving. This is where the whole...this is mixed; classroom interaction, classroom organisation; classroom interaction. There are basically our ideal classroom; classroom environment, classroom tasks etc. The children's discourse should be going on - Discourse is doing discussion. *There should be, not a traditional transmission sort of model teaching, where the teacher transmits the knowledge.* I suggest to them there should be a lot of friendly environment. There should be dialogue between teachers and pupils. *When the students dealt with problems (word problems), I will of course tell them how to solve it but in my classroom I want the pupils to give us ideas.* There will be a lot of talk, and pupils should be free to talk and give ideas.
>
> (Lecturer 6/3/95 10.30 am)

The school inspectors also commented that there should be interaction between the teacher and the students in the mathematics lesson which was not being promoted in the mathematics classroom they observed. However, there was an indication that the lecturers and the school inspectors believed that knowledge should come from the teachers, and discussions should only be based on the activity that the teacher had planned before hand, as one inspector said:

> What is clear, even in the lesson notes the teachers already set restrictions upon students. For example, questions and answers. In questions and answers there should be either students asking the questions or teachers asking the questions. But what is clear is, only the teachers ask questions. Only one way. Then there is this restriction, *the teacher only wants the knowledge to be passed on from the teacher to the students. From one aspect this is right.* but from other aspect, so that children have the time and opportunity to voice their opinions, *able to discuss with their friends or give ideas on what have been taught by the teacher.* That is not existing in Brunei's school at the moment. One way they reduce the interaction is arranging the students in rows. If they are in groups, there is still the opportunity for the students to interact, even if it is for sharing knowledge less.
>
> (Inspector 27/2/95 8.00 am)

Almost on a similar note, the other inspector was saying:

> Because of our culture we don't allow children to talk, we always talk. The children just listen. Because the teacher feels that it is wasting time. because they don't understand it. That's what I mean, these teachers, because they have been taught like that so they always follow that, where the children don't have the opportunity to talk. *Doing practical, they use their hands, their own minds and they talk about it.* So that is what the in-service should teach them.
>
> (Inspector 2/3/95 8.00 am)

It seemed that the lecturers and the inspectors agreed that in mathematics lessons there should be more interaction and communication between the teachers and the students. The extracts above indicate that the dialogues to be promoted are still based on the word problems that the teachers have prepared for the students. The students should be encouraged to discuss them, or give ideas on how to solve the word problems, as mentioned by one of the lecturers; "You can talk to the children. I have been emphasising the diagram drawing techniques - I am for teaching word problems by diagram drawing technique." (lecture, 6/3/95 10.30 am). And, as mentioned by one of the inspectors above, "so that children have the time and opportunity to voice their opinions, able to discuss with their friends or give ideas on what have been taught by the teachers..." (Inspector 27/2/95 8.00am). Through my observation I supported the inspectors and the lecturers when they said that this sort of classroom atmosphere is not happening in the Brunei primary mathematics classroom.

Besides promoting interaction and communication in the ideal mathematics classroom the school inspectors emphasised the importance of preparation before teaching mathematics, such as the preparation of mathematics exercises for different levels of ability in the classroom, the preparation of teaching aids and displaying more children's work on the walls of the classroom. The following are typical examples of responses from the inspectors:

> We must have in the mathematics classroom the facilities that we can use - practical use. You don't need many. What you need are things like weights and volumes, and some cheap teaching materials - improvised

> materials. Then these things should be ready in the corner. A lot of the children work on display - We don't often see this in the classroom. We see only the teachers' display.
>
> (Inspector 27/2/95 8.00 am)

> We really want the teacher to be ready. This is important, always ready to face possibilities that come in the classroom. For example, children in the classroom have different levels of abilities. There are the clever ones, the average and the slow ones. If the teachers prepare 20 exercises, in these 20 exercises the teachers always pick up questions for the average students. Then the clever ones would finish first. The teachers have no initiatives to add more exercises for the clever ones.
>
> (Inspector 2/3/95 8.00 am)

The inspectors emphasised the preparation of mathematics exercises, which might suggest that they want teachers to give still more exercises to the students and that doing exercises still dominates the mathematics lesson. The following confirms this assertion:

> We know that for mathematics, the more exercises the students do the more skilful they are in answering the questions. And their knowledge increases. That is why teachers give exercise after exercise in their teaching so that the students become skilful in answering mathematics questions.
>
> (Inspector 2/3/95 8.00 am)

The inspectors wanted to see that teachers have teaching aids in the classroom, and displays of students' work on the wall. It seemed that emphasis on display and teaching aids as well as on interaction in the classroom might suggest that these inspectors were in favour of a mathematics teaching approach which involves the active participation of the students both by doing activities as well as discussing what they are doing. But from the example below, given by an inspector, it was clear that the activity suggested did not allow the students to take either the initiative or control of their own learning. Probably the activity was meant to enable the students to understand the concepts eg. the concepts of addition. But the approach suggested by the inspectors did not encourage creative thinking:

> Doing practical, they (the students) use their hands, they use their own minds and they talk about it. But these teachers say 'waste of time'. Of course it is easier to say 2+2=4 rather than doing practical part of it. What they did not see is that how many other arrangements make 4, and 2+2 is only one arrangement.
>
> (Inspector 2/3/95 8.00 am)

The inspectors also commented about the classroom arrangements that they see in primary schools. They were in favour of the students sitting in smaller groups instead of sitting in rows. This was mentioned by one of the inspectors as quoted earlier, that sitting in rows discourages students from interacting with each other. He also made the observation that:

> The arrangement of the classroom, too static. When the students are seated in rows in the beginning of the year they will still be sitting

> in rows at the end of the year. These students should be grouped according to the topics we teach. Of course, we realise that these teachers teach different subjects in a day, but at least they should make the effort to use group work.
>
> (27/2/95 8.00 am)

The inspectors' views about teaching mathematics were valued by the teachers. My observations of the teachers' mathematics classroom suggested that the teachers were inclined to try to emulate the inspectors' ideal classrooms. Their classes were decorated with wall charts, most of which were done by the teachers or commercially prepared. The teachers prepared lots of questions for their students to do. At least in two of the classes, the students were grouped in smaller groups and teaching aids were used briefly to introduce the mathematics topic.

8.3 SECTION B: The present mathematics teaching in the primary schools as observed and perceived by the mathematics education lecturers and the school inspectors

The data was taken from the responses of the lecturers and inspectors based on their own observations and perceptions of mathematics teaching in the classrooms. Both the lecturers and the inspectors said that they had opportunities to observe teachers' teaching in their classrooms. For example, the lecturers referred to their observations of teaching practice during their visits to the schools as one of their tasks in assisting the Ministry of education. One of the lecturers said; "we have been doing some observations for the Ministry of Education". The inspectors also, however, observe and supervise teachers' teaching as a part of their responsibilities.

All the lecturers and inspectors commented on the present mathematics teaching that goes on in the classrooms with reference to the mathematics pre-service and in-service courses that they had conducted. They commented on teacher change that they expected during the teachers' teaching practice period. The lecturers and the inspectors believed that they had done what was required of them in term of helping these teachers through these courses. As one of the lecturers said:

> I think we have done enough for our teachers. We have been conducting in-service after in-service at the request of the Ministry of Education.
>
> (Lecturer 8/3/95 9.00 am)

However, the lecturers and the inspectors expressed their disappointment when they observed that the teachers showed only slight changes in their teaching methods. The teachers still taught in the same way as they had taught before attending the in-service courses. The lecturers described the type of teaching that they observed still practised in the schools:

> I have been doing some observations for the Ministry. Most teachers observed, basically methodology, *chalk and talk*. There was hardly any activity, hardly any demonstration, no dialogues between teachers and pupils. Teachers played the role of the expert. I mean a traditional approach.....I think teachers feel comfortable in such a role, the role of an expert.
>
> (Lecturer, 8/3/95 9.00 am)
>
> *Overemphasis on drills of the basic skills* especially in primary schools. Teachers are overdoing it

> in schools. *Too much emphasis on algorithms,* instead of ideas to bring in other things.
>
> (Lecturer 9/3/95 10.30 am)

While the lecturers were concerned about too much emphasis the teachers putting on doing exercises at the expense "activity' and dialogue between teachers and students, the inspectors were commenting on the lack of the number of exercises given to the students for practices. For example, in the comment made by one of the inspectors indicates his concerns about teachers' lack of administration of how to give mathematics exercises so that the students can do more of these exercises on their own:

> Most of the time the teachers copy the questions on the blackboard and the children copy from the blackboard into their exercise books and then do the sums. *So much time is wasted. A child does only a few sums because of the time spent on copying the questions.* The children get tired. When a child slows down, the teacher says the child doesn't know how to do the sums. So the teacher starts doing the sums on the blackboard. So while the teacher is doing the sums on the blackboard, why should the children think? The teacher is doing the thinking for them, they just copy down in their exercise books.
>
> (Inspector 27/2/95 8.00 am)

The lecturers and the inspectors acknowledged that the in-service courses and workshops were not totally a failure. There are changes made by some of the teachers in their teaching practice. This was expressed by a lecturer and an inspector in the interviews:

> There are teachers who change a bit, like improving their teaching styles. Instead of chalk and talk. But there are still a large number of teachers in schools who are still using chalk and talk, you know, emphasising giving exercises and very little activity despite the in-service courses they attended.
>
> (Lecturer, 8/3/95 2.30 pm)

> Through my experience of observing the teachers as a part of my duties, so few changes, very difficult to describe, only slight changes. Such teachers have already shown some interest, through the workshops they have done. There are slight changes, but nothing that we can be proud of.
>
> (Inspector, 2/3/95 8.00 am)

When they were asked what changes they saw in the classroom, one of the inspectors referred to some initiatives taken by some teachers to begin to use teaching aids in their classroom. It was not clear in what way the teaching aids should be used, but, from the extract below, the inspectors also considered that increasing the number of exercises given to students as classwork would indicate that the teachers were showing more interest in teaching mathematics. With one mathematics period being 30 minutes, the use of teaching aids therefore seemed to be limited to probably either the introduction of the lesson or to teacher demonstration.

> Some teachers had already shown interest in using teaching methods that involved activity, including more questions in their classwork 10 to 15 or 20 questions. And their

> teaching now started to include the use of use teaching aids.
>
> (Inspector 2/3/95 8.00 am)

The lecturers, on the other hand, preferred more time to be spent on practical activities:

> There are teachers who change from chalk and talk and begin to include a lot of practical activities for the children.
>
> (lecturer 8/3/95 2.30 pm)

The lecturers and the school inspectors agreed that teaching methods widely used in Brunei primary mathematics classrooms were, as they described them, "chalk and talk", "traditional", "overemphasis of drills and practices" and "copying lots of questions on the blackboard. A factor that was mentioned frequently by the lecturers and the inspectors that was missing in the mathematics classrooms was verbal interactions between the teachers and the students and among the students themselves. According to them, communication between the teachers and the students was almost non-existence. The flow of communication was only one way; from the teacher to the students. The following extracts taken from the interview transcripts described their concerns regarding the lack of communication in the mathematics classrooms:

> I find over the years, I think the pupils are not encouraged to talk. Pupils are not used to talking in the classroom, that is, in the teacher-pupil situation in the classroom. Pupils are docile, you know. They don't have the ability to talk. Because I think this practice has not been encouraged in the

> classroom. I think teachers are so very comfortable in the role of an expert.
>
> (Lecturer 8/3/95 9.00 am)

While the inspector, already quoted earlier, said that:

> In the classroom what is clear, only the teachers asking the questions, only one way. Then there is this restriction, the teachers only want the knowledge to be passed from the teacher to the students. From one aspect it is right, but from other aspects, so that the children have the time and the opportunity to voice their opinions, able to discuss with their friends. This is not existing in Brunei schools at the moment.
>
> (Inspector 27/2/95 8.00 am)

My observations of the 4 teachers teaching mathematics in Phase 2, showed similar pictures as described by the lecturers and the inspectors. The teachers' use of teaching aids in the classroom lessons that I observed were not planned to involve the students in active participation, to think of the activity and be creative. The activities were for imitating the teachers' demonstration. As such, students were doing the activities that the teacher demonstrated at the beginning of the lessons and no verbal interactions existed among them as suggested by the lecturers and the inspectors. These activities were quickly followed by doing exercises.

8.4 SECTION C: The lecturers' and the school inspectors' views and perceptions of the teachers' abilities, preferences for and outlook on mathematics teaching

In an interview, one of the lecturers said:

> I think the main problem with mathematics teaching in Brunei, I think, is the quality of the teachers and teaching.
>
> (Lecturer 8/3/95 9.00 am)

The lecturer's perception about the problem of mathematics teaching in Brunei mentioned in the extract above could be used as an indication of the gist of the content of this section. As mentioned in Section A of this Chapter, lecturers and inspectors believed that there were slight changes in the teachers teaching despite the in-service courses given to them. According to one of the lecturer:

> There could be a multitude of reasons why teachers did not change their teaching practices.
>
> (Lecturer 6/3/95 10.30)

8.4.1 The teachers' lack of knowledge and skills in mathematics content and teaching practice

The lecturers and the inspectors believed that a lack of content knowledge in mathematics and a lack of skills in teaching may be the reason teachers find it difficult to change their teaching practice in the classrooms. One of the lecturers said:

> There are some people (teachers) who are keen and enthusiastic, but their background and ability are rather limited.
>
> (Lecturer 6/3/95 10.30 am)

Describing the teachers' lack of mathematical content knowledge, two of the lecturers said:

> In the course of conducting in-service, I found that some elementary school level stuff they (the teachers) have forgotten. I mean, the school curriculum, the school syllabus, need to be mastered, which these people don't seem to have.
>
> (Lecturer 6/3/95 10.30 am)

> Some I think is good in content, but some have low expectation, you know. Then understanding of some mathematics topics are quite shallow. In the upper primary, teachers must understand what they are teaching.
>
> (Lecturer 8/3/95 2.30 pm)

The inspectors related the teachers' lack of mathematical content to their mathematics teaching. One of the inspectors said:

> The teachers themselves don't understand and they expect the students to understand. So because of a lack of understanding there, the teachers cannot teach properly. Out of 100 teachers only 10%, for example have studied the area of circle in school. It is a big problem. We don't have enough school inspectors to go round taking care of these teachers.
>
> (Inspector 2/3/95 8.00 am)

The widespread lack of mathematical content knowledge and skills among teachers were acknowledged not only by the lecturers and the inspectors but also by the teachers themselves (see the case studies in Chapter 5). The effects

of these should be considered in term of their consequences on the students' learning of mathematics and the teachers' ability to teach in a way which would lead students to understanding the mathematical concepts. This was mentioned by one of the inspectors:

> Lack of knowledge and confidence lead the teachers to teach in certain ways. They have no confidence so they stick to what they already know,
>
> (Lecturer 27/2/95 8.00 am)

8.4.2 The mathematics education lecturers and school inspectors perceived that some of the teachers lack both the initiative and the motivation to teach mathematics

It was stressed by the lecturers and the inspectors in the interviews that some of the teachers simply lack the initiative and motivation in teaching mathematics. This leads to the teachers looking for "the simplest method" e.g. asking the student to do many mathematics exercises in the classrooms. One of the inspectors said:

> The teachers' attitudes compared to 10 or 15 years ago still the same. For example, the Curriculum Development Department had prepared textbooks and workbooks, but at the moment teachers tend to use only workbooks for teaching mathematics, not textbooks. The answer is, this is lazy, easy to find topics that are in the examination and syllabus. That is the aim. It is simpler to use workbooks. Teachers like to look for simple and easy ways.
>
> (Inspector 2/3/95 8.00 am)

Two of the lecturers cited here mentioned about the teachers' attitudes to work and how their attitude affects the way teachers work:

> There is also a certain amount of laziness, and this is not particular to this society. I mean, they will make the minimum effort, just collect the books and go home. That's all it takes for them to teach mathematics.
>
> (Lecturer 6/3/95 10.30 am)

> It is the attitude of the teachers. If their attitudes are right, there is no problem. Even experienced teachers some of them don't do much work.
>
> (Lecturer 9/3/95 10.30 am)

It was interesting to notice that the lecturers' and the inspectors' perceptions of the teachers' attitudes towards work were similar to the teachers' attributions of their students' lack of success in mathematics, as shown in Phase 1 and Phase 2 of this study. One of the inspectors said that the teachers lacked initiative and motivation to teach mathematics and that this was the main reason why teachers still teach using the same methods without attempting to use student activity, a method suggested by the inspectors during in-service courses:

> For this reason, first, they think it is a waste of time and, secondly, no initiatives come from the teachers. You know for those activity methods there are so many things to prepare and thirdly the weakness of the planning. How to

> conduct activity method of teaching from the teachers point of view. So what is clear is the teachers' lack of initiatives, then lack of knowledge in planning teaching activity. This is the problem.
>
> (Inspector 2/3/95 8.00 am)

The lecturers and the inspectors also considered that "teachers are too comfortable in their job and considered themselves as teachers for life." (Lecturer 27/2/95 8.00). As a result, according to one of the inspectors; "they don't have interest in teaching. If they have no interest, this is where the problem starts." (Inspector 2/3/95 8.00 am). This view was shared by the lecturers, as expressed by one of them:

> They come to Teacher Training, they get qualified and they teach, that's the end of it. They have a job for life. Some of the teachers are contented with what they are doing, So when you see few changes in what they are doing in the classroom, this is to be expected, because they don't consider themselves as professionals.
>
> (Lecturer 9/3/95 10.30 am)

The same lecturer went on to say that these teachers considered teaching as:

> Just a job to fill the time. Do whatever there is to be done. Examination to pass, drill them (the students) to pass the examination. That's that.

The lecturers' and the school inspectors' perceptions of

the teachers' lack of abilities, lack of motivations and lack of initiatives in this section should be looked at in the context of the factors that inhibited them from changing their teaching practices as mentioned in the next section.

8.4.3 The modes of thinking of the parents, and Ministry of Education officers that could inhibit teachers from changing their mathematics teaching practices

There are other factors that these lecturers and inspectors believed inhibited teachers' abilities to implement the teaching methods they learnt from pre-service and in-service courses. One such factor was the expectation of the parents and the personnel of the Ministry of Education on the teachers to produce good mathematics results in the examination for example, parents wanting the teachers to concentrate on finding ways to help their children to pass the examination. As mentioned by a lecturer:

> Teachers find that this (using activity method) is difficult because parents also ask "why spent so much time on activity? You should concentrate on the examination".
>
> (Lecturer 9/3/95 8.00 am)

The teachers were also encouraged by the Ministry to produce good mathematics results. On the issue of the Ministry supporting teachers who could produce good mathematics result in the examination one of the inspectors said:

> We must understand that in this Ministry, this sort of practice is encouraged because giving a lot of exercises to the students will make the students skilful in answering

> the questions in the examination. The focus is, at the end of the day, on the examination. Then passing the examination is welcomed by all parties, not only the teachers, but the officers in the Ministry. The Ministry itself, when there are high percentages of passes, that means the teaching and learning in the school improved, and the teacher who produced good result is congratulated by letter by the Ministry. So what do you think the teachers will do?
>
> (Inspector 27/2/95 8.00 am)

One lecturer admitted that he had no idea how changing teachers teaching practice could be achieved since the Ministry of Education seemed to favour the teachers producing good results in the examination.

> So I don't know how to bridge the gap of what is needed and what is going on in the classroom. Unfortunately, the criterion the Ministry used to judge the teachers is through the examination results.
>
> (Lecturer 8/3/95 2.30 pm)

On the same note, one of the inspectors said that the teachers are teaching towards the examination for the sake of the school reputation:

> This is because the Ministry considered that, if the result of the examination is good, that means the school is doing something.
>
> (Inspector 27/2/95 8.00 am.)

This section so far has highlight some of the factors that

lecturers and inspectors believe inhibited the teachers from teaching mathematics. Some of these inhibiting factors had been mentioned by the teachers in Phase 1 and Phase 2 of this study and were confirmed by the lecturers and the inspectors. Teachers seemed to have pre-conceived ideas and beliefs about mathematics teaching which they had acquired throughout their teaching career and which are difficult to up-root. This was mentioned by one of the lecturers:

> Basically teachers, whether they are pre-service, in-service or already teaching in the schools, they don't change. They might have been exposed to some new ideas, basically what they already had in them, their beliefs, their practices, they have been doing it already for years, it's even harder to change. Their beliefs about teaching and learning are very traditional.
>
> (Lecturer 9/3/95 8.00 am)

It was difficult to justify the lecturers' and the school inspectors' claims that teachers did not change their teaching methods because they lack the initiative and motivation to change when we consider that the methods of teaching that the teachers used seemed to be supported by the ministry of education, the headteachers, the parents and students.

8.5 SECTION D: The lecturers' and the school inspectors' perceptions of the relevance and adequacy of the support given to the teachers.

8.5.1 Pre-service and In-service courses

The type of support that was often mentioned by the

lecturers and the inspectors was the in-service training courses they conducted on behalf of UBD and the Ministry, as part of their commitment to upgrade the standard of teaching and learning mathematics in primary schools in Brunei. This is stated in the UBD prospectus 1994/1995, the objectives of the in-service education UBD being described as follows:

> a) To provide opportunities for teachers and school administrators to acquire additional professional knowledge and skills;
>
> b) To assist teachers in applying to themselves new insights into the learning process and thus enhance their individual and corporate professionalism;
>
> c) To assist teachers in developing creative instructional approaches that are meaningful and adaptable to existing classroom conditions; and
>
> d) To help teachers expand their perceptions of the teaching-learning process and to initiate and respond to educational change.
>
> e) To provide a forum for teachers to exchange views and share experiences with regard to content and methodology in specific subject areas.
>
> (Faculty of Education Handbook, 1994/1995, p 120).

The lecturers and inspectors mentioned that they conducted mathematics in-service courses and workshops in the hope that they could change the teachers' practice by giving them more skills and knowledge to do so. But they admitted that they were not always successful. Changes are very

minimal. One of the lecturers admitted that they were doing what they have to do:

> What is going in the classroom is not necessarily what should go on, okay. So what we do is try to bring about changes in the classrooms.
>
> (Lecturer 9/3/95 10.30 am)

The types of courses and workshops that were introduced by the lecturers and inspectors were related mostly to methods of teaching and the mathematics content. For example, in UBD:

> ...The method courses definitely have advantages but these courses must have a theoretical side so that the teachers are involved with a discussion of methods and at the same time a fair amount of content is also revisited.
>
> (Lecturer 6/3/95 10.30 am)

The school inspectors were more in favour of practical type workshops. As mentioned by one of the inspectors:

> When we (the inspectors) give courses for the teachers it would be better to give all practical approaches - Leave theory aside.

He went on to suggest that these types of courses should also be conducted by UBD lecturers:

> All courses, whether given by UBD or the Ministry, if possible should concentrate on the practical approach. Not just showing them, but doing it.
>
> (Inspector 2/3/95 8.00 am)

The inspector also criticised UBD's in-service courses as:

> Giving too much theoretical work. They (the lecturers) give them theory, theory and more theory. They did not apply them in the classroom.
>
> (Inspector 2/3/95 8.00 am).

It seemed that the lecturers and the inspectors had different ideas about what the teachers really need in order to bring about changes in their mathematics teaching. The inspectors believed in "hands on" experience in their workshops, but one of the inspectors admitted that:

> Although it had already been shown in workshops or in-service courses how to conduct these activity methods, there seemed to be a lack of initiatives from the teachers. So what is clear, teachers feel that it is a waste of time.
>
> (27/2/95 8.00 am)

The lecturers, on the other hand, preferred in-service courses that include both the theory and method of teaching although, they realised that teachers do not prefer the theoretical part in their in-service courses, as one of the lecturers mentioned:

> If we just do what the teachers are doing in the classroom, everyone is happy. But we want to bring change. Most teachers will think "They are doing only theory, theory" They fail to realise that the goal for that kind of theory is to bring about change. So all they want is for us to give prescription, do this, do this and do this and I'll be happy.So there lies one big factor, expectation.
>
> (Lecturer 9/3/95 10.30 am)

The lecturers considered that the type of courses that involved only "hands on" experience, as suggested by the inspectors could only encourage teachers to become dependent on their lecturers to show them how to teach all the topics in the syllabus. Their arguments against these types of prescriptive courses at the expense of theory included:

> Hopefully we can strike a happy pattern between theory and practice, hopefully. But there is never enough time, never enough classroom interactions in the institution to provide courses that are more realistic of what goes on in the classroom.
>
> (Lecturer 9/3/95 10.30 am)
>
> We try to force people into our ways and spoon-feed them. So they become heavily dependent on us. I don't think telling them how to teach a topic works. They might learn it for the sake of the examination, It won't become internalised.
>
> (Lecturer 6/3/95 10.30 am)

One of the lecturers indicated his reservations about the prescriptive type of in-service courses saying that:

> We can't just tell the teachers, "Ah, this is the way you should do it." and expect them to follow. They won't, they won't, for many reasons. Maybe they are lacking something, or maybe they don't believe in that. So what then?
>
> (lecturer 6/3/95 10.30 am)

The teachers in this study had mentioned that the courses, both pre-service and in-service, that they had attended

before were not relevant to their work in the classroom. Despite the teachers saying that the courses were not relevant, all of the teachers took part in Phase 1 and 2 studies said that they were willing to attend mathematics in-service courses if these courses were offered to them in future. They were, however, suggesting that these courses should be made relevant, as mentioned by JK "for sure it (the course) must suit our classroom....." (Question 24 p 5). The courses that were considered by the teachers to be relevant to them were those in line with the inspectors' suggestions which include less theory, and more on "hands on" experience. For example, RT was saying that for him the courses should be,:

> mostly methods of teaching. If possible new ones. Not the same as during our teacher training. It should be more relevant to our teaching, that we can use in the classroom.
>
> (Question 25, p 7)

8.5.2 Teaching resources (teaching aids, textbooks and workbooks)

In Phase 1, teachers mentioned the effects of teaching resources on their teaching practices. They considered these resources as factors that inhibited their teaching in the classroom. The main complaints they had about the textbooks; the content were "too high for the students" (HM Q9 p 2) and the language is also "too high, our students find it difficult to understand" (NA Q 9 p 2). With regard to teaching aids, they admitted that there were teaching aids provided by the schools, but they were not sure how to use them.

In order to substantiate the teachers' claim, I asked the lecturers and the inspectors about these resources, for example, whether they found that these resources are relevant or adequate in the schools. They agreed with the teachers that the teaching aids and textbooks are available in the schools. Only one lecturer commented on the textbooks, saying that:

> The textbooks are a bit out of date. They really need rewriting. There are plenty of exercises and more exercises - encouraging drilling all the time.
>
> (lecturer 6/3/95 10.30 am)

The following extracts by the lecturer and the inspector confirmed this assertion about the availability of these teaching aids and textbooks:

> Actually the teaching aids and textbooks and so on are there in the schools. Of course not many and enough for every classes, but teaching aids like weights, measurements and also textbooks are provided in the schools.
>
> (Inspector 2/3/95 8.00 am)
>
> Our schools are well equipped. In-service funds are made available to purchase instruments for use in the schools.
>
> (8/3/95 2.30 pm)

The availability of teaching aids in the schools, according to the lecturers and the inspectors, did not guarantee that they are to be used by the teachers. In fact, they agreed that the teachers must have the initiative to used them in their classrooms, which according to them, the teachers are lacking. For example, a lecturer said:

> Of course our schools are well equipped, but teachers have to have initiatives as well. And of course these initiatives should be well responded by the Heads. the Heads should see that these are equally distributed.
>
> (Lecturer 8/3/95 2.30 pm)

One of the teachers who took part in the Phase 1 study confirmed that some teachers did not make use of the teaching aids although these were available. She said:

> There is quite a collection of teaching aids in the resource room. Teachers can use these aids if they want. From my own experience, not many teachers really make use of the teaching aids, except the manila cards. I don't really know why they don't use them; as for me, I am teaching Primary 6.
>
> (RA Q 8 p 2)

The administration of these teaching aids was criticised by the inspectors. For example, an inspector said:

> Of course materials provided by the schools can be enough, if properly utilised. But in some schools these materials are in the storeroom. And these teachers, I don't know why, either they are too shy to ask the head teacher or whatever. When you ask them "Do you have these materials?" the answer is always, "I don't know". See. they simply say "I don't know".
>
> (Inspector 2/3/95 8.00 am)

8.5.3 The mathematics syllabus and the scheme of work

Although the teachers in Phase 1 were referring to the scheme of work and the syllabus as one of the factors that inhibited their teaching of mathematics, the lecturers and the inspectors did not make any negative comments about the syllabus or the scheme of work. In fact one lecturer commenting about the mathematics curriculum, said that:

> I think the mathematics curriculum is okay. Not bad, better than before. If only the teachers make the time and do their job well, a lot of pupils can benefit from the existing syllabus. I don't think we can make it simpler. I think the major area to be tackle is the teachers themselves. Somehow we have to do something about our teachers.
>
> (lecturer 9/3/93 8.00 am)

The inspectors and the lecturers did not seemed to agree with the teachers' assumptions that the mathematics syllabus and the scheme of work are the factors that hindered the teachers from practising the mathematics teaching strategies they learned through their pre-service and in-service training. The inspectors and the lecturers still maintained that the teachers do not have enough initiatives and they are not trying hard enough.

8.6 Conclusion

As I had mentioned in my synthesis of Phases 1 and 2, the teachers that I observed displayed a sincere concern for their students and they also felt a strong sense of a moral responsibility for their students to achieve good grades in mathematics. The teachers were interested in the learning and in the future of their students. At the same time, they were concerned about the poor quality of their students'

performance and mentioned that they spent considerable time and effort in preparing for "relevant exercises" for their students.

The lecturers and the inspectors wanted the teachers to use "activity methods", probably a more "child-centred" approach, in their mathematics teaching. They wanted more verbal interaction between the teacher and the students and among the students themselves. But there is the question whether we really understand the dilemma that the teachers have to face, preparing their students for the monthly tests and examination. Also to be considered are the teachers beliefs' about their students' weaknesses e.g. in calculations, in memorising the facts they have learned, and in using the English language. All this compelled the teachers to believe like "drill-sergeants" which they believed was necessary.

Then there is the factor that was mentioned by the lecturers, the inspectors as well as the teachers in this study which might, in no small way, contribute to the teachers' persistent way of keeping to their old teaching strategies, viz. the teachers' lack of mathematical content knowledge which seemed to influence their pedagogical content knowledge and confidence in teaching the subject. According to Shulman (1986) "pedagogical content knowledge" includes:

> The ways of presenting and formulating the subject that make it comprehensible to others...alternate forms of presentation, some of which derive from research where other originate in the wisdom of practice...An understanding of what makes the learning of specific topics easier or difficult: the

> conceptions and preconceptions that students of different ages and backgrounds bring with them to the learning of those most frequently taught topics and lessons.
>
> Shulman, 1986, p.9)

The fact that two of the teachers in this study used teaching aids and grouped their students in smaller groups suggest that the teachers were aware that they were required to use teaching aids and group work. They appeared to be trying to comply with the requirement of the courses they attended - using teaching aids in teaching mathematics. But they seemed to have a lack of understanding of how activity methods should be conducted in the classroom. In the case studies in Chapter 5, the findings of Phase 2 highlight the fact that the teachers misinterpreted or reinterpreted some of the mathematical terms such as "activity methods" and "practical methods". If the teachers misinterpret the terms, it was probably because they did not understand how to apply the terms in the real classroom situation and this should be dealt with in the in-service and pre-services courses. But if they reinterpreted the terms, the teachers were probably trying to apply them to the context of the classroom while at the same time taking into considerations the other constraints, such as covering the scheme of work, and giving students lots of exercises. Whatever the reason, the teachers still did not change their teaching practice.

I have mentioned earlier in this study that verbal interactions between the teachers and the students were almost non - existent, which seems to support what the lecturers and the inspectors said. But as I explained in Chapter 6, this might be the influenced of the culture of the society in Brunei. At least one of the lecturers thought so:

> Brunei society is a bit different. In Brunei, there is this respect for the teachers. The students are, so much so, that they think that to speak out is a sign of disrespect for the teacher or disturbing the class.
>
> (Lecturer 6/3/95 10.30 am)

We cannot, however, assume that the teachers did not use the teaching methods proposed in their pre-service and in-service courses because they were reluctant to do so. I, for one do not agree fully with the lecturers and the inspectors when they said that the teachers lacked motivation or initiative. As highlighted in Phase 2 of this study the teachers that I observed were always prepared to give their students the mathematics lessons they believed their students required. For example, at the time of this study ND was teaching Primary 6, and in about two months time her students will be sitting for their PCE examinations. ND had prepared lots of exercises for her students to practice because this was what her students needed. In one of my observation notes, quoted earlier in the case study, her students were asking her for more exercises even when there were only 10 minutes left before break time. This means that the teachers might not be able to change their teaching practice either because of the constraints mentioned earlier in Phase 1, or simply because they believed that the teaching method that they were using was the best for their students.

In Chapter 6, I referred to the roles of the teachers and students in teaching and learning in Brunei. Teachers responsibilities include giving the students the opportunity to practice as many mathematics exercises as

possible and covering the scheme of work to prepare their students for the examinations. The students, on the other hand are responsible for their own learning, which includes their having to work hard, be good at multiplication tables, and be attentive in the classroom when the teacher is teaching. Therefore, if the teachers feel that they have performed their roles, they feel it is not their problem if their students still did not obtain good grades. According to one of the teachers in Phase 1:

> ...So far I didn't have problem with teaching mathematics, except my students. They sometimes forget what they have learnt.
>
> (NA pg 5)

Therefore, if the teachers believe that there is nothing wrong with their teaching method, they may feel that they have no reason at all to change their teaching practices. In other words, these teachers needed motivation and reasons for changing their teaching practice.

The findings of this study also supports the notion that if teachers are not convinced that the teaching methods that they learned from both pre-service and in-service courses will work in the real classroom, they will not adopt these new teaching strategies. Cuban (1990) describes teachers' autonomy and isolation as a comforting factor that "decouples" policy from implementation. Cuban argues that once the classroom door is shut, the teacher is left alone to do what it is, they believe, fostering learning. Often the teachers' strong moral responsibility and sense of caring towards their students guides the action. The beliefs of these teachers are influenced by what seemed to work for them and their students in the classroom.

In Phase 1 of this study, the teachers also perceived that the pre-service and in-service courses they attended were both irrelevant and unrealistic to their classroom teaching. The reason could be that the factors as mentioned in Phase 1, that they believed inhibited their teaching such as the pressure of the examination and the scheme of work. But the teachers in fact believed that the courses that they attended during pre-service courses, as mentioned by ND; "I think it is good" (Q22 p4), while JK's comments on the ideas that were being promoted in the South East Asian Conference of Mathematics Education in 1991 were; "I know the ideas were excellent, but can we really apply them in the classroom?" (Q24 p5). Battista (1994) also reported that many teachers have beliefs about mathematics and mathematics teaching that are incompatible with efforts to reform mathematics teaching. Teachers' beliefs play very important role in predicting their thinking, their motivation, intentions, and behaviours in the classroom.

CHAPTER 9

DISCUSSIONS AND RECOMMENDATIONS

9.1 INTRODUCTION: My interest in the Study

In Chapter 1 I mentioned that I have been a mathematics education lecturer for the past 16 years. I was involved in almost all activities associated with mathematics education in Brunei Darussalam as well as having a role as a mathematics education lecturer, for example, as group supervisor in Modern Mathematics Project in 1970s. I shared the same concerns of other mathematics lecturers (see Phase 3 of this study) as noted by Lopez-Real, Veloo & Maawiah (1992) that the mathematics performance of the Primary 6 students, particularly in word problems (Mathematics Paper 2), is still very low despite the seemingly high percentages of students who obtained Grades A to D in mathematics in the PCE examination (see Appendix IV). One of the lecturers who took part in the study in 1992 mentioned in the interview that:

> With PCE students, word problems are the most difficult - PCE analysis we did before on Mathematics Paper 2 (on word problems), ***barely answered***. In fact, if you talk about average mark (Paper 1 and Paper 2), ***average mark is very low - very low.*** In fact they (the examination officers) didn't want to tell us the true marks.
>
> (Lecturer 6/3/95 10.30 am)

The "true" mathematics marks of the students are not available to the parties concerned, such as the teacher educators, and the teachers. There remains the possibility

that the results, which are publicised by the Examination section in the schools and to the public are amended or "inflated" by the authorities concerned, to fit the requirements of the pass-mark for promotion to the next level of education. I believe that it is the true mathematics performance of these students which provide the best indication of the effectiveness of mathematics teaching that goes on in the classroom.

If what has been said so far is to be taken seriously, and I believe it should be, then most of the students in primary school are not performing as well as expected in mathematics. What chance do they have to pass mathematics examinations in Secondary schools?

9.2 FOCUS ON THE TEACHERS' BELIEFS AND PRACTICES

The reason for me to focus this study on the teachers and to put them "on the centre stage" (Nolder, 1992) is that it has been suggested that teachers possess a "rich store of knowledge" which could produce theories, beliefs and values about their role and about the dynamics of teaching and learning (Clark and Peterson, 1986). Teachers and their beliefs may play a major role in mathematics reforms since teachers' beliefs lead to actions and these actions impact students (Clark and Peterson 1986). Tobin, Tippins & Gallard (1994), in reviewing science education research, also emphasise the importance of taking account of teachers' perceptions, stating that:

> ...beliefs are critical ingredients in the factors that determine what happens in the classrooms.
>
> (p. 64)

It is believed that teacher beliefs' systems are significant factors in motivating a change in teaching behaviour (Tobin, Tippins & Gallard, 1994) and that previous reform efforts have largely ignored the influential nature of teacher beliefs on changes in teaching practice. Identifying teacher beliefs and understanding how these beliefs influence teachers' behaviours are now issues of particular interest to researchers. The study which I conducted have not new to this field. In fact I reviewed, at the beginning of Phase 2 (Chapter 4), some of the studies that have been done in similar areas (Thompson, 1982; MacGalliard, 1983; Kesler, 1985; Lerman, 1986; Grouws et al, 1990 and Sosnaik, Ethington & Varelas, 1991).

Through this study, I hope I can contribute to the field of mathematics education by focusing on the most neglected area in the past, the beliefs and practices of primary mathematics teachers in a developing country. I have found in my study that the teachers who took part in it are still teaching mathematics with their main focus on the examinations. As stated earlier, this practice was well supported by the personnel from the Ministry of Education, Headteachers, parents and students. Another finding in this study is that the individual teacher's beliefs about mathematics and his/her beliefs about mathematics teaching have been found to be consistent with his/her instructional practices.

The findings also suggest that teachers have no real understanding of the nature of mathematics. The teachers participating in this study admitted that they were not good in mathematics and that they had no confidence in teaching the subject even at primary level. As the findings

suggest all teachers in this study believed that mathematics consists of numbers and word problems that could be solved using the four operations. It seemed to these teachers that mathematics is found only in textbooks and workbooks. Their beliefs about mathematics teaching are also geared towards enabling their students to be skilful in translating the word problems so that they can be solved using these operations.

The study also suggests that the teachers' beliefs derive from their teaching experiences particularly from those that had worked for them and the teachers before them. Therefore the teachers' beliefs were developed in order to meet these practices, in other words, to justify what they were doing in the classroom. For example the teachers taught their students mathematics by practising all the possible exercises in the workbooks and textbooks. Therefore, they believed that mathematics consists only of numbers and word problems that could be solved using the four operations.

Mathematics Education in UBD seemed to be rejected by these teachers in favour of the above beliefs and teaching practices. Throughout my study, it seemed that the teachers rejected the teaching methods they learned from UBD for three very distinct reasons: firstly, the teachers' beliefs that they were required to cover all the topics in the scheme of work and workbooks because the examinations questions are based on them. Secondly, the study, highlighted the fact that the teachers did not understand what they had learned in UBD. Thirdly, the pressure from the Ministry personnel and the parents and their students encouraged the teachers to teach for the sake of the examination.

UBD takes an active part in conducting pre-service and in-service training of these teachers. To bring about changes in the teachers' teaching is the fundamental role of this institution. This is stated in the Faculty of Education, UBD, Handbook 1994/1995;

> Another aim of the Faculty is the acquisition and extension of the store of fundamental knowledge about education. Through the continuous study of education problems by the academic staff, the Faculty hopes to increase existing knowledge about education, particularly in the Brunei context. It is through such contributions that the professional service of education is consistently improved.
>
> (p. 1)

It seems, from the findings of my study, that UBD has failed in its mission and role.

In this Chapter, I want to highlight the findings of my study which might be able to provide further insights into current practices of mathematics teaching in primary mathematics classrooms in developing countries like Brunei Darussalam, particularly on aspects which are considered to influence the teachers' teaching practice. The main possible contribution which this study can provide to the field of mathematics education is that not only have individual teachers' beliefs about school mathematics and beliefs about mathematics teaching been shown to be strongly interrelated with their instructional practice in the classrooms, but that the teachers have also been shown to be homogeneous in their beliefs and practices. This finding is slightly different from most studies carried out

in the past which indicated that not only were the individual teachers' beliefs and practice often inconsistent, but there were also differences in beliefs and practices across the teachers in their studies (Thompson, 1984; Brown, 1986; Oprea and Stonewater, 1987; Sosniak, Ethington & Varelas, 1991).

9.3 THE POSSIBLE CONTRIBUTIONS OF MY STUDY TO KNOWLEDGE ABOUT MATHEMATICS TEACHING IN DEVELOPING COUNTRIES

In this section, I present what I hope will be some contributions to the existing knowledge in the area of mathematics education in developing countries. These contributions are presented as findings which have been formulated from the analysis of my study.

Finding 1: The teachers in my study supported the present examination system in Brunei.

Many researchers, such as Shepard (1989), have mentioned the effects of examinations on teachers' teaching. Others have pointed out that there is little research on teachers' attitudes and beliefs about examinations (Manke & Loyd, 1990). My study has highlighted the fact that teachers support the examination and believe that examinations are an acceptable form of assessment in Brunei by the personnel of the Ministry of Education, the Headteachers, the teachers, the parents and the students. There are few, if any studies done in the past which identified teachers attitudes towards examination (Manke & Loyd, 1990). However, the finding of my study highlighted the fact that the teachers' have positive attitudes towards examinations. This attitude seemed to influence the teachers' choice of teaching methods they use at present in the classroom.

Finding 2: Teachers believed that they lack mathematical content knowledge, skills and confidence in teaching the subject.

In this study, the teachers' believed that they lack mathematical content knowledge. The lack of skills in teaching mathematics was given as one of the reasons by the teachers, the lecturers and the school inspectors why the teachers were unable to use other teaching methods besides the ones used in the textbooks and workbooks. The teachers' claims that they lack mathematical content knowledge was also confirmed by the mathematics education lecturers and the school inspectors.

My study has attempted to reveal what might be the effects of such a lack of knowledge, of skills and of confidence on the teachers' teaching in the classroom. The teachers believed that they found it difficult to change and use teaching methods other than the ones they were using when I observed them and also to help their students get higher grades in the examination.

The contribution of my study relating to teachers' lack of pedagogical knowledge and skills is that this study has shown that content and pedagogical content knowledge may not be an important factor in deciding the teaching methods that teachers use in the classroom after all. So far, this study has highlighted the teachers' beliefs that their personal pedagogical knowledge, both theoretical and practical, is considered relevant by them and their students as long as the knowledge and their teaching practices are consistent with the proposals of the Curriculum Development Department concerning the examination syllabus including the content of the textbooks

and the scheme of work. Therefore, this finding is contradictory to studies such as those of Shulman (1986, 1987); Peterson, Fennema, Carpenter and Loef (1989) which suggest that teachers' pedagogical content knowledge is an important category of teachers' cognition that "may be importantly linked to teachers' classroom actions and ultimately, to students classroom learning in mathematics." (Peterson, Fennema, Carpenter and Loef, 1989, p 36).

Finding 3: The students' successes and failures in mathematics are attributed to their own lack of ability and efforts in the mathematics classroom

My study has shown that the teachers may attribute the students' failures to their own lack of ability and efforts because, in Chapter 6, teachers in this study looked at teaching and learning as two separate but related responsibilities. The responsibilities of the teachers were to cover all the topics in the scheme of work, to look for "relevant" exercises which are similar to the questions asked in the examination, and to provide their students with enough practice in how to solve these exercises. As long as the teachers performed these responsibilities, they would not be held responsible if their students did not get good grades in the examination. Similarly the students are responsible for their own learning, such as, having to be good at multiplication tables, paying full attention in the class, and practicing doing the exercises. If they did not carry out these responsibilities, and they failed mathematics in the examination, it would be their own faults. The students seemed to understand these divisions of responsibilities as well as the teachers.

Finding 4: The System of Education in Brunei Darussalam and the "modes of thinking" of those involved influenced the mathematics education in Brunei in certain ways.

The centralised system obliges the teachers to be tied closely to the prescribed syllabi and prescribed textbooks and workbooks. Coupled with the teachers' lack of knowledge of mathematics content, skills and confidence, this system gives them little opportunity to experiment and be innovative in their teaching, and also less freedom for children to explore and experiment with wider knowledge within their ability range and interests. Teaching and learning mathematics in the English language further handicaps the teachers and the students in the sense of engaging themselves in verbal interactive activities, an essential part of the mathematics classroom in a way that has implications for all other mathematics lessons.

The implementation of the Bilingual system of education in Brunei Darussalam, to some policy makers is a compromise between the 1959 Constitution (strengthened by two Education reports, 1959 and 1972, which significantly and boldly stated that Malay should be the medium of instruction in all schools) and the preferred "choices and wishes" of parents and the general population of Brunei Darussalam. The introduction of the bilingual education policy in 1985 has met no opposition from the population. Jones (1990), quoted earlier, states:

> ...a few Malay die-hard nationalists voiced their opposition, but these people found themselves in a dilemma after sending their children to the best English medium private schools in the State.
>
> (p. 297)

As mentioned earlier in Chapter 7, the general consensus of opinion amongst Bruneians is that Bilingual Policy is a progressive step in the right direction.

Education is considered as a direct instrument of economic and social change, especially in a new emergent nation like Brunei Darussalam. Most of the "openings" for such social-climbing opportunities lies in the professional categories such as engineers, doctors, lawyers etc.

Such professionals have been fortunate enough to receive further education at university level and obtain a degree, inside or outside the country, and are further privileged by obtaining salaries several times higher than wages paid to ordinary workers. It is no wonder then that the talk about a "revolution of rising expectation" reflects a striking reality. The pressure to climb up the ladder of formal schooling as far as possible is formidable. Mathematics is one of the core subjects that enables a student to do so.

The examination system in Brunei is widely valued and acceptable to teachers. The Brunei Education System is distinctively selective. Though no one is to be denied education, the higher levels of education are open only to those who show ability and promise through examination results.

In this study, the cultural assumptions about teaching, knowledge and expertise also help teachers to create their mathematics teaching strategies. Observation of the teachers teaching practice, interviews with the teachers, analysis of teacher education practices, the textbooks, the scheme of work and the syllabus all suggest that this view

of knowledge is seen as generally unproblematic. Knowledge is found in texts. It is to be mastered.

Then, there is the notion of respect for authority, the values and culture norms. This is stated as part of the aims of the New Education System in 1985;

> 4) To cultivate in each individual a sense of loyalty to the Monarch, the State and the Law and an awareness of responsibility as a citizen as well as the obligation to act upon that responsibility.
>
> 5) To cultivate in each individual the values and culture norms of Brunei Society, centred on the Principle of a Malay Islamic Monarchy.
>
> (Education Report 1984, p. 1)

These aims are particularly relevant in a classroom environment when they are translated into the aims of primary education. One of these aims is;

> 3) To establish sound moral and spiritual principles.
>
> (The Education System of Negara Brunei Darussalam, 1985 p. 11-12)

Each individual in society has a position and role governed by strict social norms. To show disrespect or to challenge the authority of the teacher is considered a serious crime, which bring shame not only to the individual but also to his family. It is an indication of "bad upbringing".

In Chapter 7 of this thesis, it was mentioned that an image of the educated man centred on the teacher or "guru"

(influential or revered teacher). Hence, in Brunei, the students call their teacher "Cikgu" (short for "guru"). This is an indication that teachers have "superior knowledge" and the source of knowledge is to be passed on to the students. This mode of thinking which exists in Brunei, encourage a formal approach to teaching mathematics concentrating more on the transmission of knowledge as I observed happening in the mathematics classroom in this study.

This typical model of Brunei society indicates the modes of thinking that are valued:

1. traditional norms and ideals, such as respect for scholarship and intellect with a heavy emphasis on learning and required knowledge.

2) respect for the authority of teachers and elders in the community is expected.

3) there is a strong emphasis on good behaviour and morality as the foundation of knowledge. The free development of children with an emphasis on "affective" development within the progressive classroom environment, such as is found in liberal Western society, are antithetical to the modes of thinking prevalent in Brunei society.

Finding 5: Despite the pre-service and the number of in-service training courses conducted by UBD and the Ministry of Education, teachers still use the same teaching methods they used before attending the courses.

The teachers in this study believed that the mathematics

courses they attended during their pre-service courses are not relevant, are unrealistic and cannot be used in the real classroom. They described their need for appropriate and relevant in-service mathematics courses that they can use in the classroom, but so far they believe that no in-service course which addresses their needs exist (see Phase 1 Chapter 3). These teachers have obtained a basis of confidence for teaching mathematics from other sources, such as, from learning how other teachers teach and from their own experiences, both as teachers and as students.

The teachers in my study showed signs of the "pragmatic Sceptics" mentioned by Doyle and Ponder (1977). According to Doyle and Ponder (1977), apart from the fact that the ultimate fate of professional development programmes for teachers depends on the decisions made within the classroom situation, teachers will feel that professional development efforts are often unsuccessful in achieving their goals.

In my study, it has been highlighted that the factors that inhibited teachers in teaching mathematics were related not only to the teachers' lack of knowledge and skills in mathematics but also to the System of Education and the culture in Brunei Darussalam. Any attempt to introduce teachers' professional development has to go beyond attempting to change the teachers' beliefs and practices. Teachers in Brunei seem to have difficult choices even if they decide to adopt the ideas they may receive in pre-service or in-service courses because the teachers seem to be "moulded' into using the same methods of teaching. There are several reasons for this: their own lack of knowledge and skills; the modes of thinking of the personnel in the Ministry of education, parents and students; the examination system, namely the format of the

examinations; the workbooks and the textbooks; the scheme of work and the culture in Brunei Darussalam. My study has shown that if change has to be considered, then it has to go beyond the scope of pre-service and in-service teacher training courses in UBD.

9.4 RECOMMENDATIONS BASED ON THE RESEARCH

Taking into account the conditions created by the factors that teachers believed inhibit or influence their teaching practice, and the factors relating to the culture and modes of thinking of the society in Brunei Darussalam mentioned throughout this study, an attempt will be made to show how changes in teachers' beliefs and mathematics teaching practice may be brought about. From this study, it has become clear that joint efforts should be made by the Ministry of education and UBD to improve the conditions of mathematics education in Brunei. The Director of the Curriculum Development Department (quoted several times in this chapter) has voiced her concerned about the effect of examinations on the teachers' teaching and students' learning. Therefore, these concerns not only exist among the teacher educators but also within the Ministry of Education.

Given the difficulty of the education system to cope with changes, particularly those relating to culture and expectation of the society, such as the examination system, any improvements in the quality of mathematics education will have to lie within the constraints of the existing education system. Throughout this study, the teachers expressed their concerns about the performance of their students in the examination. The main influence on the

teachers' teaching practice was the examination. The format of the examination questions made it possible for the teachers to use teaching methods that concentrate on familiarising the students with questions from past question papers and from workbooks. This study had shown that, if efforts to improve mathematics education in Brunei are to be made, the teachers will have to change their present methods of teaching. But they have to be convinced that changing their teaching methods is worthwhile and will benefit their students in the examination.

The main feature that has been highlighted in this study and that may help to convince the teachers, the personnel in the Ministry of Education and the Headteachers is the students' "true marks" in the PCE examination. It has been stated earlier in the Chapter that the real results of the PCE examination, including Mathematics Paper 1 and Paper 2, were not made available to them. Instead they were presented with the "inflated marks" by the Examination section of the Ministry of Education. The teachers particularly have been led to believe that the results of the PCE show that they have been successful in teaching mathematics to their students. Therefore, this "false" information about their students' achievement might have convinced them to keep on using the same teaching methods in their classroom.

Teachers and the personnel in the Ministry of education should also be made to realise the effects of "poor" mathematics teaching in the primary school on the students when they are in secondary schools. Research about the number of failures and drop outs as the result of poor achievement in mathematics in secondary schools (Mathematics being one of the compulsory subjects that

students have to pass at every level in secondary school up to Form 5) should be conducted and the findings should be published and made available to the teachers and to the Ministry of Education. This type of information would undoubtedly convince not only the teachers but also the Ministry of education of the need to improve the present mathematics education in Brunei.

Recommendations of some of the ways to improve the mathematics education in Brunei Darussalam.

1. The Ministry of Education, through the Examination section, should be involved in this effort. The Ministry must be persuaded to change the format of some of the mathematics questions in the examination, such as those exercises that emphasise rote memory and contain "keywords and clues" to questions, which require the students to understand the questions to be able answer them. Such "clues" and "keywords" should be removed because these types of questions require the students to develop higher level thinking in order to answer them in the examination. Judging from the way the teachers depended on the past question papers in this study, this probably encourage the teachers to teach according to the requirements of this type of examination.

2. This study contradicts the body of research that asserts the critical contributions of teachers' beliefs on classroom behaviour (Fullan and Miles, 1992; Pajares, 1992; Battista, 1994). The finding of this study suggests that the teachers teaching experiences, particularly the ones they believed to have worked for them, seem to influence teachers' beliefs. Pajares (1992) shows that changes in behaviour come before changes in beliefs while Boyd and

Wandersman (1991), referring to health related behaviour, show that behaviours are easier to change before behavioural habits have been established. This suggests that teacher preservice training may be the most timely period to provide opportunities for students to establish favourable beliefs and practices regarding the nature of mathematics teaching. Since it has been suggested that teachers become indoctrinated into the system during their schooling (Pajares, 1992), pre-service experience alone would not provide a stable belief structure. Therefore strategies to change in-service teachers' beliefs are also needed.

3. There was also evidence to support the teachers' lack of ability to articulate a philosophy for teaching mathematics in the interviews with the teachers. For example, they reinterpreted the terms used by the curriculum planners and the mathematics education lecturers to describe mathematics teaching. These teachers also admitted that they lacked the mathematics content knowledge and pedagogical knowledge, and that therefore they were not confident to teach the subject. It must become the job of mathematics teacher educators to improve the teachers' knowledge and skills in mathematics education.

4. According to Bolman and Deal (1994), pre-service teacher education courses can help teachers construct frames to understand individual students, teaching methods and the curriculum. However:

> What they don't teach in teacher education is how to broaden your vision, how to sense the deeper social dynamics of your classroom and your school, and how to work with others to transform schools

> from the isolating and under-rewarding environments that they so often become.
>
> (p. 45)

As pre-service teachers learn about teaching mathematics in the primary school, they must be given opportunities to think about their teaching within the context of the school culture, which may not be supportive of the type of mathematics teaching that they have learned about in the institution. In this study, the teachers did not demonstrate the ability to articulate their own theoretical and analytical frames beyond a description of mathematics teaching as an "activity method" or "practical method" when they had the opportunity to do so within the rich context of the classroom.

One strategy that mathematics education lecturers may employ to help teachers analyse and prepare for conflicts between approaches to teaching mathematics and the culture of schools is case study. The case study approach or method can be defined as an instructional technique whereby the major ingredients of a problematic teaching situation are presented in narrative form to preservice teachers for the purpose of pedagogical problem solving. Noted scholars have advocated the infusion of the case-based pedagogy into preservice teacher education coursework (Doyle, 1990; Shulman, 1992). The small body of reported research on the use of cases indicates promise in the context of mathematics pedagogical content knowledge (Barnett, 1991). Yet, no published research has been conducted on the case study method approach in developing countries.

Well-crafted case study can be used by the mathematics

education lecturers to lead the teachers towards critical analyses of the problem presented. Such analysis can help the teachers develop productive solutions to problematic situations encountered during teaching that take account human resources, symbols, structures and politics.

Mathematics education lecturers may wish to take up the case study approach as a part of the endeavours to improve mathematics education. By discussing cases rich with interpretations, teachers can explore and articulate their beliefs about teaching mathematics to young children. Through careful attention to the teachers talk in these discussions, the mathematics teacher educators can ascertain teachers' understandings of the relationship between theory and practice, and the perceived role of teachers and students in promoting exemplary mathematics education in primary school settings. Teachers' beliefs regarding mathematics teaching and learning should be identified through reflective activities so that further training can focus on the identified beliefs.

5. The above recommendations may well have reached the planning stages by the Ministry of education and UBD. The most important step is to convince the teachers that these work in the classroom. One of the most feasible measures to be taken is to enhance the teacher efficacy using Bandura's (1986) model. This model suggests that four components are needed for efficacious beliefs. They include: experiencing success, observing success, persuasion, and physiological feedback. Concrete teacher training associated with each of these components may be helpful.

1) For experiencing success, teachers need to be provided with concrete and successful experiences in practising the desired behaviours during teacher training.

2) For observing success, according to Bandura (1986), efficacy can also be fostered by observing the success of a credible model. Credibility is established through possessing the necessary skills and being viewed as "similar" to the observer. This implies that peer teaching may be helpful to the observer as well as to the teacher of the behaviour.

3) For persuasion, Bandura (1986) also asserts that efficacy can be enhanced by persuasive messages directed at altering negative beliefs and fostering positive beliefs regarding behaviour.

4) For psychological feedback, Bandura (1986) contends that psychological feedback from behaviours also contributes to efficacy. Therefore, affective feedback such as "yes, this lesson really works" may foster positive efficacy beliefs.

The suggestions for a new focus for teacher training, both pre-service and in-service, described above, are not without their foreseen problems. One of them is that, as the data in this study suggest, teachers perceive that they do not possess the ability and mathematical knowledge to bring about changes and therefore it will be difficult to be able to participate in this type of teacher training course. Weakness in the English language is another factor that may handicap this type of programme. Teachers may not be able to participate in reflective practices.

This study aimed to highlight the teachers beliefs and practices and does not provide the answers to the problems described above. However it does indicate the way for further research and highlights that there are alternative

ways of improving the mathematics performances of primary school students without changes which will affect the whole educational system. However, the type of innovation mentioned above does merit investigation and perhaps experimentation.

9.5 LIMITATIONS OF THE STUDY

1. This study has concentrated on the beliefs about school mathematics and beliefs about the mathematics teaching of 12 teachers in 5 primary schools through observing and interviewing 4 teachers within a period of 2 weeks for each teacher. The reasons for the choice of teachers and schools have been given in Chapter 2 on Methodology. There are perhaps no grounds for generalising the findings of the teachers' beliefs and instructional practices from these observations to other teachers and classrooms across the whole State. I would, however, speculate that, since all the teachers in this study have consistently common beliefs and instructional practices, it is most likely that other teachers in the State have similar beliefs and practices. "Commonality" and "conformity" are the norms in Brunei society.

2. There are times when I would like to have asked the teachers direct questions such as "What are your beliefs about school mathematics?" and "What is your philosophy of teaching mathematics?" in order to analyse how articulate these teachers' beliefs are, their understanding of school mathematics and what the philosophy of teaching mathematics means to these teachers. Indeed, the question of how well teachers can articulate a coherent belief of mathematics and its teaching is worthy of some consideration if the

findings of this study are to be used for future reference because, despite the fact the teachers' beliefs were highlighted in this study, none of them were able to speak during the interview in a cogent manner about their beliefs.

3. In Chapter 2 on Methodology, I had mentioned that I have had to be cautious in my role as a researcher not to allow my interpretations to be influenced by the fact that I was already well-known to the teachers, both as their former mathematics lecturer and friend and very familiar with the teaching and learning situations in Brunei. There has always been the temptation that my own assumptions and rigid adherence to my own point of view might cloud my interpretations of the interview transcripts and observation notes. On the other hand, more positively, my own role as mathematics education lecturer in Brunei might give the data a distinctive flavour, a perspective which another external researcher would not have achieved. Similarly it can be argued that the external researcher may have gained viewpoints on the data that I was unable to access. Therefore the limitations of this study are that the classroom observations are described according to my own interpretations and did not involve collaboration with any other researcher.

9.6 IMPLICATION FOR FURTHER RESEARCH

a) The teachers in this study were representative of many primary teachers in Brunei who had no mathematical background when they joined UBD. The minimum requirement for joining the Teachers' Certificate course is 4 "O" levels including English and Malay, while for the BA (Primary Education) course it is 2 "A" levels. Mathematics

is not normally included as one of these "O" and "A" levels. It remains to be seen whether or not this facts promotes a situation whereby it is likely that primary school teachers manifest the type of teaching, given that they apparently, described in this study, not only lack the mathematical content knowledge but also lack confidence in their ability to teach the subject.

It would be interesting to see if further research in the form of a comparative study could be conducted with the teachers taking part in this present study and those teachers who possess "A" levels in mathematics before they join the UBD. The objective would be to see if these latter teachers' beliefs and practices conform to the beliefs and practices of the teachers in this study. Such students mostly non-citizens who are not eligible for Government scholarship to further their education at University level are in UBD now, pursuing the Certificate of Education course. Starting in 1995, Ministry of Education is introducing (as a pilot study) specialist mathematics and science teachers in primary schools in Brunei. The findings of such research might force UBD to revise its selection procedures and admission requirements for teachers who are to be trained as mathematics specialist teachers.

b) In mathematics teaching, there are a few teachers who prove to be more effective than others. Therefore there are 3 basic questions that can be used as research questions: Why do some teachers seem to be more effective than others? Why are the majority of teachers still unsuccessful? What could be done to improve the unsuccessful teachers?

A good basis for comparison would seems to be the Mission

school primary teachers and the Government primary school teachers in Brunei. It is a known fact among educators and parents alike in Brunei that Mission schools always produce far better results in PCE compared to Government schools (see tables of mathematics result in Appendix IV).

c) Further issues that might be of interest to the mathematics lecturers concerns the question of whether the beliefs and instructional practices used in teaching mathematics are in fact different in kind from the beliefs and practices they use for teaching other subjects such as Science. This research may help to uncover issues such as; firstly how widespread these beliefs and practices are, secondly, whether they can be shown to have an adverse effect on the learning of mathematics, and thirdly, whether they can be shown to be related to the existence of a poorly integrated and poorly conceptual system in relation to mathematics.

9.7 CONCLUSION

Given the inability of educational systems to cope with revolutionary change, the effect of improving the mathematics education in Brunei lies within the constraints of the centralised system of Education with centralised examinations.

This thesis has put the teachers "at the centre stage" (Nolder, 1992) in its attempt to highlight the state of primary mathematics education in Brunei. The teachers' beliefs about school mathematics, their beliefs about mathematics teaching and their interrelationship with instructional practices are used to identify some of the

factors that the teachers believed inhibited their mathematics teaching in the classroom.

It has been suggested, in this thesis, that there are possibilities of improving mathematics education without having to introduce major changes to the education system and the curriculum. In accordance with Hoyle's (1974) restricted and extended professionality, which refers to a high level of skills in classroom practice, a contextualised broader range of knowledge and skills and hopefully, to improve classroom practise, teacher education can play an important part in this endeavour. As mentioned by Judge, cited in Hoyle and Megary (1980);

> Any school of education can demonstrate the sincerity of its respect for the practitioner by committing major tasks of training to him.

As to reputation and credibility;

> Schools of education will flourish by being scholarly, to be sure, but their scholarship must be related to the improvement of practice in the schools.
>
> (p.348)

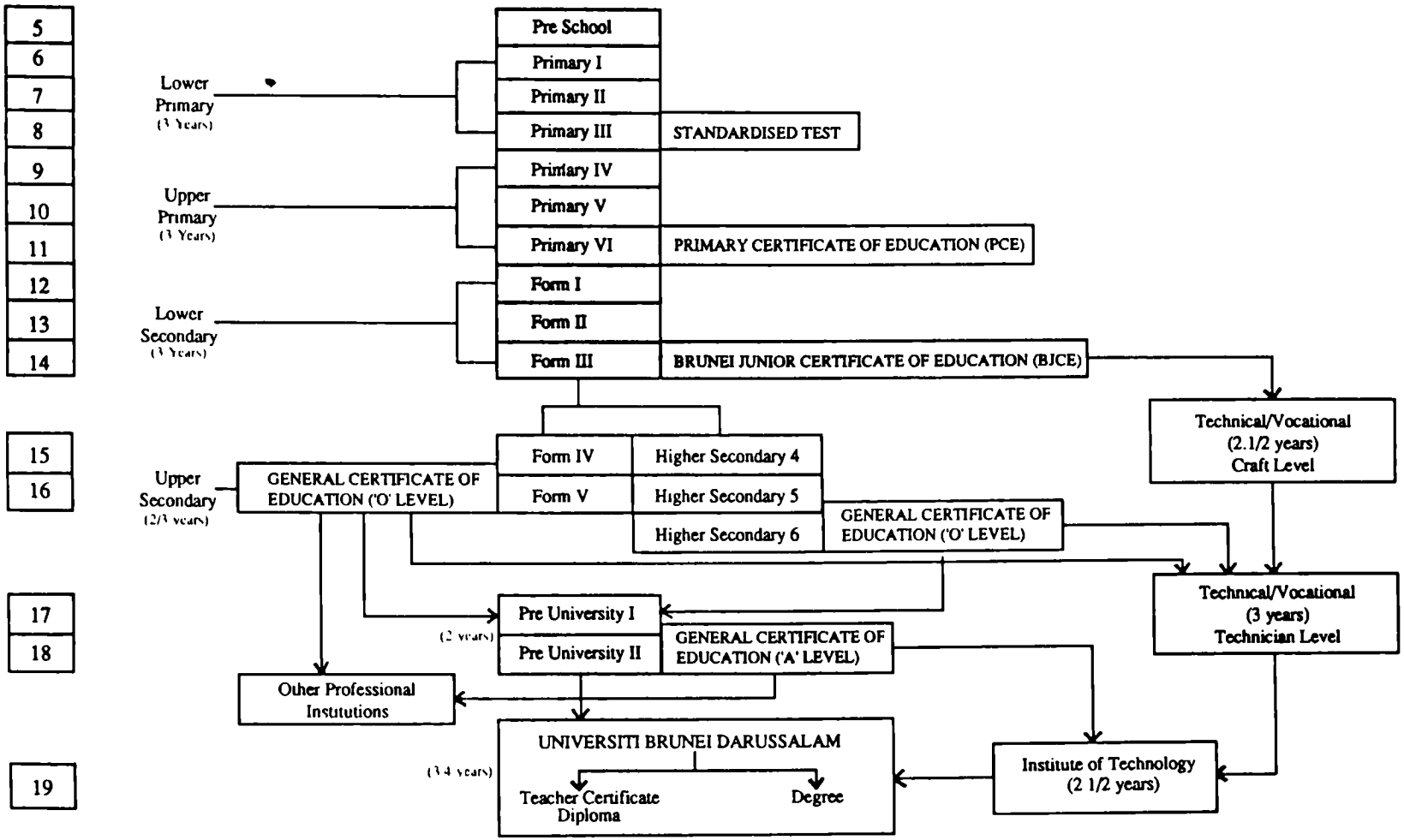
PAGE NUMBERING AS FOUND IN THE ORIGINAL THESIS

CHART II

STRUCTURE OF THE SCHOOL SYSTEM

Ministry of Education

(Pre School -- Pre University)



Appendix II

SCHOOL CURRICULUM

PRE-SCHOOL

ble V

SUBJECTS	WEEKLY TIME ALLOCATION	LANGUAGE MEDIUM
Pre-School education comprises: Basic Language, Numeracy, Courteous Behaviour, Basic Islamic Religion, Movement, Self Discipline, Singing and Development of Talent. These basics are taught through an integrated approach, using examples from the children's own environment. (The teaching of the content of one subject is not separated from that of another). Informal teaching methods are used throughout.	There is no strict division of the timetable into subjects since an integrated approach, which is largely activity-based, is used.	All teaching is in the medium of the Malay Language.

LOWER PRIMARY
(Primary I - III)

The table below shows the subjects, their time allocation and the medium of instruction.

Table VI

NO.	SUBJECT	PERIODS PER WEEK (1 period is 30 mins)	LANGUAGE MEDIUM
1.	Malay Language (the study of Jawi begins from the third term of Primary I)	10	Malay
2.	English Language	10	English
3.	Mathematics	12	Malay
4.	General Studies	4	Malay
5.	Islamic Religious Knowledge	3	Malay
6.	Physical Training	2	Malay
7.	Art and Handicraft	2	Malay
8.	Civics (Singing, Recreational Activities, The Traditional Customs and Way of Life of Brunei Darussalam)	2	Malay
	TOTAL 8	45	2

+ Half an hour each morning is devoted to early morning activities such as gardening and cleaning the school, before the commencement of normal lessons.

Appendix III

UPPER PRIMARY
(Primary IV - V)

The table below shows the subjects studied at Upper Primary level, their time allocation and the medium of instruction:

Table VII

NO.	SUBJECT	PERIODS PER WEEK (1 period is 30 mins)	LANGUAGE MEDIUM
1.	Malay Language	10	Malay
2.	English Language	10	English
3.	Mathematics	10	English
4.	Science (including Health Science)	3	English
5.	History	2	English
6.	Geography	2	English
7.	Islamic Religious Studies	3	Malay
8.	Physical Education	2	Malay
9.	Art and Handicraft	2	Malay
10.	Civics (Singing and Recreational Activities based upon the traditional way of life of the people of Brunei Darussalam	1	Malay
	TOTAL 10	**45**	**2**

+ Half an hour each morning is devoted to early morning activities such as gardening and cleaning the school before the commencement of normal lessons

Appendix IV (a)

CANDIDATES PERFORMANCE IN PRIMARY CERTIFICATE OF EDUCATION

GOVERNMENT SCHOOLS

Year	Number Examined	Total Passes	%
1984	3256	2645	81.23
1985	2056	1575	76.61
1986	2414	1957	81.07
1987	3003	2365	78.75
1988	3907	3012	77.09
1989	6860	4976	72.54
1990	4959	3719	74.99
1991	5241	3484	66.48
1992	5396	3883	71.96
1993	5171	3630	70.20

NON-GOVERNMENT SCHOOLS

Year	Number Examined	Total Passes	%
1984	957	785	82.03
1985	1019	869	85.28
1986	1125	936	83.20
1987	1299	1116	85.91
1988	1296	1123	86.65
1989	1111	1020	91.81
1990	1204	1135	94.27
1991	1129	1084	96.01
1992	1154	1098	95.15
1993	1257	1195	95.07

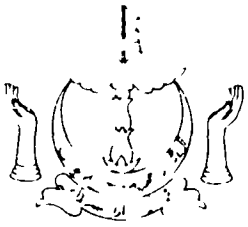
GOVERNMENT SCHOOLS & NON-GOVERNMENT SCHOOLS

Year	Number Examined	Total Passes	%
1984	4213	3430	81.41
1985	3075	2444	79.48
1986	3539	2893	81.75
1987	4302	3481	80.92
1988	5203	4135	79.47
1989	7971	5996	75.22
1990	6163	4854	78.76
1991	6370	4568	71.71
1992	6550	4981	76.05
1993	6428	4825	75.06

PENCAPAIAN CALON DALAM PEPERIKSAAN PRIMARY CERTIFICATE OF EDUCATION MATHEMATICS 1989 - 1993

TAHUN	JENIS CALON	RAMAI DUDUK	R A M A I A - D	%	C A L O N C	%	M E N D A P A T D	%	C - D	%	G R E D F	%
1989	N	7983	7196	90.14	2215	27.75	2224	27.86	4439	55.61	787	9.86
	SK	6873	6104	88.81	1905	27.72	2086	30.35	3991	58.07	769	11.19
	SBK	1110	1092	98.38	310	27.93	138	12.43	448	40.36	18	1.62
1990	N	6298	5627	89.35	1892	30.04	1283	20.37	3175	50.41	671	10.65
	SK	5096	4448	87.28	1683	33.03	1215	23.84	2898	56.87	648	12.72
	SBK	1202	1179	98.09	209	17.39	68	5.66	277	23.04	23	1.91
1991	N	6357	5554	87.37	1869	29.40	1520	23.91	3389	53.31	803	12.63
	SK	5230	4458	85.24	1677	32.07	1441	27.55	3118	59.62	772	14.76
	SBK	1127	1096	97.25	192	17.04	79	7.01	271	24.05	31	2.75
1992	N	6556	5633	85.92	1770	27.00	2414	36.82	4184	63.82	923	14.08
	SK	5394	4495	83.33	1487	27.57	2258	41.86	3745	69.43	899	16.67
	SBK	1162	1138	97.93	283	24.35	156	13.43	439	37.78	24	2.07
1993	N	6428	5603	87.17	1702	26.48	2164	33.67	3866	60.14	825	12.83
	SK	5171	4373	84.57	1459	28.22	2040	39.45	3499	67.67	798	15.43
	SBK	1257	1230	97.85	243	19.33	124	9.86	367	29.20	27	2.15

Appendix V



جبتن سكولة ٢
كمنترين قنديقتن
نكارا بروني دارالسلام

ELEX DIREDUC BU2577
ELEPHONE 241511

JABATAN SEKOLAH-SEKOLAH
KEMENTERIAN PENDIDIKAN
NEGARA BRUNEI DARUSSALAM

Department of Schools
Ministry of Education
BRUNEI DARUSSALAM

ujukan Kami: KP/DS/19:3(115)
)ur Reference

22 Julai, 1992.

Yang Mulia,
Dayang Zaitun binti Haji Taha,
No. 5, Simpang 456-25,
Kampong Beribi,
Jalan Gadong 3188,
Negara Brunei Darussalam.

Dayang,

Per: MEMOHON KEBENARAN MELAWAT SEKOLAH-SEKOLAH RENDAH DAN SETERUSNYA MENEMUDUGA GURU-GURU BAGI TUJUAN PENYELIDIKAN

Dengan hormat merujuk surat Dayang bertarikh 16 Julai, 1992 untuk memohon kebenaran bagi Dayang menjalankan penyelidikan untuk kajian Ph.D Mathematics Education.

Seperti yang dikehendaki, sukacita dimaklumkan Jabatan Sekolah-Sekolah tidak ada halangan bagi Dayang menemuramah/soalselidik kepada Guru Besar-Guru Besar di sembilan buah sekolah-sekolah Rendah, Negara Brunei Darussalam dengan syarat-syarat berikut:-

(1) Memberikan satu salinan hasil penulisan Dayang yang telah diselesaikan kepada Pengarah Sekolah-Sekolah, Kementerian Pendidikan.

(2) Projek ini tidak akan menggangu pengajaran dan pembelajaran di sekolah-sekolah berkenaan.

Sebelum menjalankan projek ini, Dayang adalah diminta untuk berjumpa dengan Guru Besar-Guru Besar yang terlibat dalam projek Dayang itu untuk urusan selanjutnya.

Dengan salinan surat ini, Guru Besar-Guru Besar yang berkenaan adalah diminta memberi bantuan dan kerjasama kepada Dayang Zaitun binti Haji Taha mengenai dengan perkara ini.

/2.....

Sekian untuk makluman dan perhatian Dayang.

Wassalam.

"BERSOPAN SANTUN BUDAYA KERJA"

[DATIN HAJAH JAHRAH BTE HAJI MOHAMAD]
Pegawai Tugas-Tugas Khas,
bp: Pengarah Sekolah-Sekolah,
Jabatan Sekolah-Sekolah,
Kementerian Pendidikan,
Negara Brunei Darussalam.

s.k.
Penolong Pengarah Bahagian Pelajaran Rendah
Guru Besar, Sekolah Rendah Bendahara Sakam Bunut
Guru Besar, Sekolah Rendah Sinaut, Tutong
Guru Besar, Sekolah Rendah DMW, Lambak, Berakas
Guru Besar, Sekolah Rendah Delima Satu, Jalan Muara
Guru Besar, Sekolah Rendah Raja Isteri Fatimah, BSB
Guru Besar, Sekolah Rendah Kg. Mata-Mata, Gadong
Guru Besar, Sekolah Rendah Kiarong, Brunei
Guru Besar, Sekolah Rendah Ahmad Tajuddin, Kuala Belait
Guru Besar, Sekolah Rendah Muhammad Alam, Seria, Belait

/dkhn.

Appendix VI Interview questions for Phase 1

SECTION 1: LESSON PLANNING AND TEACHING STYLES

1 .What was the most recent mathematics topics that you taught? Can you describe to me how the lesson was delivered?

* Introduction
* Presentation of content
* Conclusion
* assessment

2. What did you try to achieve in that lesson ? To what extent you achieved it?

3. How do you feel teaching that lesson?

If interesting or any positive remarks:
* Why was it so?

If 'no'
* Why not?

4. How did the children find the lesson?

Why were they ..... about the lesson?
(enjoying, bored, interested...etc.)

Were they progressing well with their work?

5. Did you plan your lesson before hand?

If 'yes'
* Describe how you planned the lesson.

When?
How long did you take?
What were included?
Did you have any assistance?

6. How typical was the lesson that you have just describe to me?

If 'not typical'
* How was it unusual in any any way from your other lessons?

SECTION 2: RESOURCES

I would like to ask you more about teaching resources.

7. In the lesson you have describe, were there any teaching aids used?

If 'yes'
Who provided the teaching aids that you used?

If 'self', Why?

If 'others', * Please specify the providers.

8. What other teaching aids/materials are easily available for teachers to use?
If any,
* Who provides these teaching aids/materials?
* Where are they stored?
* Are you familiar using these teaching aids?

9. What about textbooks, can you tell me more about the textbooks in term of:

* suitability in content.
* suitability to the pupils in Brunei.
* Are they enough for all the pupils in the class?
* the way the content were presented.

10: What other books do you use which are recommended by the Curriculum Department Department. (From the brainstorming session)

SECTION 3: CLASSROOM ORGANISATION

Let us now discuss about the classroom organisation when teaching mathematics.

11. Refering to the mathematics lesson that we have been discussing, how were the children arranged in your class?

12 .Why were the classroom arranged like that?

13. What other classroom arrangements do you used? Why do you arrange them like that?

14. Who decided on the way you arrange your classroom?

SECTION 4: CURRICULUM (CONTENT AND OBJECTIVES)

Let us move on to discuss on the mathematics curriculum.

15. Lets go back to the lesson again, what do you think of the topic?

* If this is part of a bigger topic, how long do you have to finish the topic?
* Its suitability to the ability of your class.
* arrangement within the syllabus.

16. (Showing the primary mathematics syllabus to the teachers) Have you seen this document before?

If 'yes', What is it?
*What do you think of the syllabus?
- Is it suitable to the ability of the student in Brunei?
- Is the arrangement of the topics acceptable to you?
- Is it easy to implement?
If 'no',
* What other document do you use ?
* Who prepare the document?
* What are you comments about the document? (From

brainstorming session

17. (Write each of the objectives taken from the syllabus on pieces of paper)
Are you familiar with these statements concerning mathematics and the children learning mathematics?

If 'yes'
* Where are these statement taken from?
If 'no'
* Why were you not familiar with the document and the statements above?

18. What kind of teaching methods, would you think, are most appropriate to achieve this kinds of objectives?
* What problems, if any, would emerged in using these teaching methods?

19. How do this teaching methods relate to your actual teaching?

20.Do you think teachers in Brunei should be involved in decision-making concerning:

* Mathematics syllabus
* Distribution of resources
* assessment?

If 'yes'
*How do you think this should be carried out?

If 'no'
* Why not?

21. Would you like to take part in the planning of the mathematics curriculum?

If 'yes'
* In what way can you contribute to the planning?

If 'no'
* Why not?

SECTION 5: TRAINING (PRE-SERVICE AND IN-SERVICE)

In this section, we will be discussing about in-service and pre-service training of mathematics teachers.

22. Can you tell me who or what influences your teaching?
* In what way they influenced your teaching?

23. Have you attended any INSET on mathematics education before?

If 'yes'
* What was the inset all abiut?
* Who organised the INSET?
* How long? (Duration on the INSET.
* In what way did you find it useful or not useful?
* Are you willing to attend more INSET in future?

If 'no' Why not?
* Are there any other Departments besides the one you have just mentioned, offering INSET on mathematics teaching?

If 'yes'
*How do you think the INSET similar or different from the one you have just mentioned?
* In what way are they similar or different

24. What areas of further training do you think more useful to the teachers? In what ways are they useful?

25. Who do you think should organise the INSET for mathematics teachers?

SECTION 6: SUPERVISIONS

26. Discussing about supervision, who was the most recent visitor to you classroom?
If any,
* Why do you think he/she visited you?
* Tell me about the visit, Did you discuss about the visit with the visitor?
* Do you make any changes to you teaching as the result of the visit (What effect the visit has on you?)

27. Besides the person that you have just mentioned, who else visited you?
If any:
* Why do they visited you?
* How often do these people visited you?

28. How do you feel when these people visited you while you are teaching or in the staffroom?

29. Is there any other methods of supervision that you prefered?
If 'yes'
* How?

SECTION 7: ASSESSMENT

Thank you, now can we move on to discuss about assessment.

30 What kind of assessment do you have to conduct to you class?
* monthly
* termly
* yearly
* Why are you doing these assessment?
* Who prepared the questions for these assessment?

31. In what ways these assessment influence you teaching styles?

32. Do you agree on the present method of assessment used in Primary schools in Brunei?
If 'no' Why not?
* How would you like it to be?
* How could the assessment procedures be improved?

SECTION 8: OTHERS (ADDITIONAL QUESTIONS ARISING FROM ISSUES MENTIONED BY TEACHERS DURING THE BRAINSTORMING SESSION)

33. Should Primary schools have specialists teachers for mathematics?

If 'yes' Why?
If 'no' Why not?

34. What do you think about using calculators in Primary schools for mathematics ?

If 'yes' Why?
If 'no' Why not?

35. How do feel about teaching mathematics in English to primary school students? Do you find any problems?
If 'yes'
What are these problems?

36. Do you have problems with the timetables for mathematics?

If 'Yes' What are the problems?

37. How do you feel about repeaters in your class?

38. What kind of interruptions do you experience while you are teaching?

If any,
How do these interruptions affect your teaching of mathematics?

Appendix VII

INTERVIEW QUESTIONS

FOR MATHEMATICS EDUCATION LECTURERS IN UBD.

1. For information regarding what are viewed as important in the Teacher Education Course in Mathematics.

1.1 In your opinion, which aspects of the mathematics course in UBD has been most successful?

1.2 What do you think made them successful?

1.3 On the other hand, what aspects of the course has been less successful?

1.4 Why do you think they are not successful?

1.5 Can you tell me how would you tell if the course has been a success or not?

2. For information on what the mathematics teaching and learning process in the classroom is perceived by the mathematics education lecturers to be like.

2.1 According to you as a mathematics education lecturer, what is your image of an ideal mathematics classroom?

2.2 How is the average mathematics lesson really conducted in the classroom?

2.3 How does the average mathematics lesson differ from your ideal?

2.4 Why do you think there are such differences?

3. For information on what is perceived to be the demands on the teacher in order to implement the ideas and approaches of teaching mathematics learnt in UBD.

3.1 How aware are you of what has gone on in the mathematics classes in terms of implementing the mathematics courses conducted i UBD?

3.2 How have you come to know this?

(a) Which parts of the course are put into practice?

(b) Which ones are not put into practice? Why?

i) Probe on knowledge being practiced.

ii) Probe on the methods being used.

iii) Probe on the preparation being made.

iv) Probe on the organisation of the lesson.

4. For information on the extent to which the preparation and support activities for implementing ideas and approaches learnt in UBD have been useful and sufficient to the teacher.

4.1 Training of the teachers

(a) If you can change the mathematics courses provided to the teachers, what changes would you make?

(b) Is there anything else you think could be done to help the teachers?

4.2 Materials prepared for the mathematics teachers

(a) Which aspects of the materials (workbook, textbooks, teaching aids etc) do you think the teacher feel useful?

(b) Do you feel that the materials prepared have been adequate?

(c) If you can change these materials, how do you propose to do it?

4.3 Supports given to Teachers

(a) Which aspects of the supports do you think the teachers will find useful?

(b) How do you think the support could be improved?

(c) Is there anything else you think could be done to help the teacher?

5. For information on factors at the school level considered important in encouraging teachers to implementing ideas and approaches learnt in UBD.

5.1 On the whole, what do you yourself feel are important factors at the school level which encourage the teachers in implementing these ideas and approaches learnt in UBD?

5.2 Which factors at the school level discourage the teachers implementing these ideas and approaches?

5.3 Why do you think these factors discouraged the teachers from implementing them?

5.4 What more could be done to encourage the teachers?

BIOGRAPHICAL DATA

- sex
- Age
- Qualifications
- Years of working experience as mathematics education lecturer:
  (a) in Brunei
  (b) oversea institutions.

Appendix VIII

INTERVIEW QUESTIONS

FOR SCHOOL INSPECTORS

1. For information regarding what are viewed as important in the Teacher Education Course in Mathematics.

1.1 Throughout your observation of teachers teaching mathematics in the schools, have you notice any changes in their teaching?

If the answer is "yes"

1.2 What are these changes?

1.3 Can you describe some of the changes?

1.4 What are the possible reasons for these changes, if observed?

If the answer in "no"

1.5 Why have there not been any changes?

2. For information on what the mathematics teaching and learning process in the classroom is perceived by the School Inspectors.

2.1 According to you as a school inspector, what is your image of an ideal mathematics classroom?

2.2 How is the average mathematics lesson really conducted in the classroom?

2.3 How does the average lesson differ from your ideal?

2.4 Why do you think there are such differences?

3. For information on what is perceived to be the demands on the teacher in order to implement the ideas and approaches of teaching mathematics learnt in UBD.

3.1 What do you think are the aims of the mathematics education courses conducted in UBD?

3.2 What do you think the teachers have to do to meet these aims?

3.3 In your opinion, what are the demands on the teacher for teaching mathematics in the light of these aims?

Please describe the actual demands made on the teacher.

(a) Probe on the knowledge being practiced.

(b) Probe on the methods being used.

(c) Probe on the preparation being made.

(d) Probe on the organisation of the lesson.

4. For information on the preparation and support activities for implementing ideas and approaches learnt in UBD have been useful and sufficient to the teacher.

4.1 Training of the teachers

(a) If you can change the mathematics courses provided to the teachers, what changes would you make?

(b) Is there anything else you think could be done to help the teachers?

4.2 Materials prepared for the mathematics teachers

(a) Which aspects of the materials (workbooks, textbooks, teaching aids etc) do you think the teacher feel useful?

(b) Do you feel that the materials prepared have been adequate?

(c) If you can change these materials, how do you propose to do it?

4.3 Supports given to the teachers

(a) Which aspects of the supports do you think the teachers will find useful?

(b) How do you think the support could be improved?

(c) Is there anything else you think could be done to help the teacher?

5. For information on factors at the school level considered important in encouraging teachers to implementing ideas and approaches learnt in UBD.

5.1 On the whole, what do you yourself feel are important factors at the school level which encourage the teachers in implementing these ideas and approaches?

5.2 Which factors at the school level discourage the teachers implementing these ideas and approaches?

5.3 Why do you think thses factors discouraged the teacher from implementing them?

5.4 What more could be done to encourage the teachers?

BIOGRAPHICAL DATA

1. sex
2. age
3. Qualifications
4. Years of working experience:
   a) as school inspector
   b) Others.

Appendix IX

VALIDATION 1

Teacher: A

1. The teachers teaching objectives:

* I want the students to know more about what I am going to teach.

* I want my students to be able to do the exercises I give them.

2. The general teaching methods used by the teacher:

* Demonstrate the lesson infront of the class using teaching aids.

* Ask the students to do exactly what I am demonstrating.

* Draw diagram on the board representing the the procedures step by step.

* Give worksheets to the students and answer the questions from the worksheet by themselves.

3. Teacher's helping strategies to help students to learn:

* Give students lots and lots of exercises.

* Give the students exercises from the workbook because the students have to be familiar with the workbook.

* For the sake of examination, I have to give students lots of questions so they can practice the examination techniques.

* I ask the students to look for clues in the question. It is easier to look for clues because by looking at one word they know what to do.

* Give the students "suprised tests" from time to time to keep them prepared all the time.

* Use drawing to help students to understand the words problems.
* I walk round the class to check them do their work.

4. Evaluating the success of the teachers teaching:

* The students can answer the questions, that is important. If they can answer all the questions that means my lesson is successful.

5. Why do teachers need helping strategies:

* For words problems, the more exercises they do the more they will understand.

* I always get good results in monthly tests because from the beginning of the year I give them tests regularly so that they can memorise the questions.

* Most of the students could answer the questions. The other, they are very poor. They will never be able to understand.

* These pupils are very funny, if they are confuse about how to do the exercise they keep quiet.

* For the sake of examination. The students can practice the examination techniques.

* If other teachers set the questions for monthly test, most of the questions they will take from the workbeek.

* Especially during the holiday I don't think they look at their work they might forget.

* If the topics are not thoroughly cover, and the questions come out in the examination. I will be blamed.

* Usually if they learned the topic last year, they cannot remember now.

6. Classroom arrangements:

* I use groupwork for all the subjects that I teach.

* I notice one thing, students learn better if their friends explained to them than me.

* The students can talk when they are following me doing the demonstration. But not when they do exercises. Otherwise , they will copy from each other.

7. Teacher's general feeling about mathematics and mathematics teaching:

* I think I use the same method as I was taught during teacher training.

* My method of teaching, I was just following the workbook. If I don't follow the workbook, my students will suffer, because the questions will be the same as the workbook.

* I want my students to pass the examination 100%. This is the most prized feeling.

* I don't have problems with teaching mathematics as long as I give students lot and lots of exercises.

* I am confident of teaching mathematics, because I have only one or two weak students. So I just revise with them.

* I like mathematics besides English and Science.

* Although I am confident all my students can past the examination, I am still worried because they always forget what they have learnt.

Teacher: B

1. The teachers' teaching objectives:

* The students should understand how to solve simple words problems.

* The students should be able to use the four operations in solving the questions.

* To evaluate the students understanding of previous lessons.

2. The general teaching methods used by teacher:

* Write two questions on the blackboard and demonstrate to students how to solve them.

* Write the problems on the blackboard and the students copy the questions and answer in their books as classwork.

* Write a problem on the blackboard and ask all the students to read aloud.

* Call some students to solve the questions on the blackboard.

* Ask students to do questions from the worksheets.

* Correct some questions the students did wrong on previous classwork or homework on the blackboard.

3. Teachers helping strategies to help students to learn:

* Give more time on words problems.

* Sometimes use translation to teach words problems.

* Reading aloud help the students to understand the questions.

* Help the students to identify keywords in words problems.

* Arrange the students in rows with the slow learners sitting infront.

* Give the students many oral and written drills.

* Give students a lot of revisions and a lot of exercises.

* Students do not understand the English language. So I use a lot of blackboard work so students can see, not only hear.

* Make sure that students know who pass or fail in classwork.

4. Evaluating the success of the teachers teaching:

* I would be satisfied if three quarter of my students can do the exercises.

5. Why do teachers need helping strategies:

* Students are confused what symbols to use in solving the words problems.

* The students are weak in divisions and this has something to do with times tables.

* As an incentive and motivation for the student to learn more.

* In examination, the examiners always follow the exercises from the workbook.

* This is their transition period. They were using Malay before.

* The students like to show off to their friends when they get correct answers.

* A lot of blackboard work is very clear and easier for the students to understand.

* The students are very poor in words problems.

* The students are very poor in calculations. They cannot do their sums mentally.

* To look for "keywords" is the procedure how to solve words problems.

* The students are lazy, they don't bother to study eventhough the teacher tell them to revise the lessons.

6. Classroom arrangements:

* In arrange my students in rows because if they are in groups, it is very difficult for them to see the blackboard.

* I think it is not good arranging the students in groups because they become lazy and rely on the smart students.

* I really want them to concentrate on the blackboard. If I start to group them, very difficult to get their full attention because they talking to each other.

7. Teacher's general feeling about mathematics and mathematics teaching:

* I use the teaching method because I think most teachers teach this way.

* I am interested to learn more about how to teach mathematics.

* Maybe simple words problems should be introduced to students when they were in lower primary classes.

* I am not comfortable with teaching mathematics, but I am trying my best to make my students understand my lessons.

* There is no time to discuss with colleagues because everybody is busy.

Teacher: C

1. The teacher's teaching objectives:

* To enable the students to answer the questions and to recall what they have learned previously.

* To enable the students to apply what they have learned in their written exercises.

* My objective is for the pupils to be able to read and understand the problems and give the answer.

* I want my class to be the best. Every monthly test all my students pass the examination.

2. The general teaching methods used by the teacher.

* Revise yesterday's lesson by writing some of the questions that I find most students could not answer and explained to the students how to solve the questions.

* Demonstrate an example how to solve today's problem by writing the problem on the board and use teaching aid and diagram.

* Ask the students to do the rest of the questions from the workbook as classwork.

3. Teacher's helping strategies to help students to learn:

* Use sketch or diagram on the blackboard instead of teaching aids.

* Use symbols for example, vertical addition and subtraction to make it easier for students to understand.

* Use the same teaching methods use by most of the teachers so that the students are not confused.

* I will give the students written works that cover all the topics.

* I give students exercise every lesson to evaluate my teaching as well as the students' understanding.

* Sometimes I use Art or P.E periods to teach mathematics.

* Every Saturday, I will give them revisions to cover the whole topics from beginning of the week until words problems.

* I use mostly examples and exercises from workbook because the examination questions look like the ones in the workbook.

4. Evaluating the success of the teachers teaching:

* If I see many of my students get correct answers then my lesson is successful.

5. Why do students need helping strategies:

* The students kept quiet when they are confuse about the lesson and how to do the exercises.

* I want my class to be the best. Every monthly test all my students pass the examination.

* I am worried my students might forget. During the holiday I don't think they look at their work.

* Like words problems the more they do the exercises the more they understand.

* At least most of the sudents can do the exercises but others are very poor. It is the same like other subjects. They will never be able to understand.

* Students have difficulties with English language, that is why we have to really make them understand.

* Many of these students really need help. Some of them will call the teacher, but some are very shy.

* So far I don't have problems with teaching mathematics except my students. They sometimes forgot what they learned.

* To make the students understand words problems is the biggest headache for the teacher.

* They are poor in calculation and also got poor memory, then they have to understand the language. I think this is asking too much from the students.

6. Classroom arrangements:

* I arrange my students in groups, because I am going to do group work.

* When they are doing exercises I want them to do it individually.

7. Teacher's general feeling about mathematics and mathematics teaching:

* Asking the students to do exercises on the blackboard make the students feel confident, to show to the other pupils that the pupil who does the work is intelligent as teacher to do the work on the board.

* It is important to have tests every Saturday, so I know which topics need to be revise again.

* I feel happy when I teach mathematics.

* Teaching words problems is the biggest headache for the teacher.

* Many teachers use the same teaching method, and sometimes it is successful.

* Students are also used to this teaching methods from Primary 1, so if we change now most probably they will not be able to follow.

* To teach I think using symbols is easier. But I want them to do practical work, so that is why I ask them to use teaching aid in the beginning. They can always check the answer later with symbols.

* For me not able to cover all the topics worries me most. This is link to the examination.

Teacher: D

1. The teacher's teaching objectives:

* I want them to answer all questions given to them.

* I want to find out if they still remember the previous topics.

2. The general teaching method used by the teacher.

* I will discuss with the students the past lessons for a while, the mistakes they made and after that I will give them the worksheets to do individually.

* Writing down the question on the blackboard. Just polishing their skills in answering the questions. They also have to do questions from previous question papers.

3. Teacher's helping strategies to help students to learn:

* I ask them to do some work on the blackboard infront of the other pupils. I am involving them in the study.

* Give students mostly exercises. They practice a lot and lots of exercises from past question papers and workbook.

* In words problems, I ask the students to look for clues. I said, at the end it will give you "to find the sum" then you add the numbers, and then the difference then take away, while division is to share.

* We should give them a lot of practice as well as exercises. And then drilling.

* Just revision, we are nearly the examination, so we are just polishing them for the examination.

* I think giving them a lot of questions help them during the examination.

* Even every morning from 7 to 7.45 am we give the students remedial for the sake of examination. And the remedial is always mathematics.

4. Evaluating the success of the teacher's teaching:

* If more than three quarter can do most of the questions. I think I achieved my objective.

5. Why do teachers need helping strategies:

* These pupils they always forget when the real day comes. Suddenly they cannot remember, as if they never seen the questions before.

* I think if they see how it was done on the blackboard, they will understand and remember it.

* These students, if you don't remind them again and again they will forget. Sometimes they forget thr formula, sometimes they even how to calculate.

* This is good thing about revisions, we know which topics we need to teach again.

* If all my students pass the examination, the other teachers and my headteacher will know if I am really doing my work.

* What worries me is that the students cannot do the questions in the examination. Because these students, only the clever ones can do, the slower ones I don't think they can pass.

* I feel nervous that my pupils cannot do it, and I am afraid of the questions that come out, because we did not know the questions, because this is centralised.

* Teaching with the help of previous question papers because only slight change, the content of the questions are the same, not much different.

* I am not worried, all questions always have clues in them. So I just follow.

* (Using clues) I think this is the easiest. Students are very poor in understanding English. So to help them at least they can answer the questions.

* At that period, okay, then tomorrow,still okay, but later on when they do the questions again on the same thing, they forgot about it. That is where drilling should come in.

* To revise with them all the topics again before the examination, otherwise they will forget.

* I am worried because I don't know which school set the questions. I must really prepare my students.

* If the topic, like fraction, is difficult we give them lots of questions to do to practice.

6. Classroom arrangement:

* Throughout this revision weeks, I always arrange them in row by row. Because they are only doing the exercise.

7. Teacher's general feeling about mathematics and mathematics teaching:

* School mathematics is not in everyday mathematics. For example Algebra and geometry. this is still important to learn from school. This is what mathematics is all about.

* The way teacher is teaching motivate pupils. If the way he is teaching is interesting, the atmosphere is good, that's means the pupils like it.

* I think the teacher is a very strong influence on the pupils learning. If the children respect the teacher, they will learn more from him.

* At the end of the day, the most important thing is that they can answer the questions i the examination.

* the new method of teaching, I still not sure if this new method works for us. Because like I said, we have the examination to think about.

* Doing a lot of exercises motivate students. Doing activity they don't consider that as learning seriously. They consider that for small children.

* If the result of the students not good that means there is something wrong with our teaching.

* The questions in the examinations are always the same, they only change the numbers.

* Actually in mathematics, not much different, It is the same since we were students.

* Depend on the topic, sometimes the topic is easy and sometimes complicated. When it is complicated, even we as teachers feel not confident to teach it.

* Actually we are not happy, because we are rushing, and we are teaching for the sake of the examination, not for the sake of motivating the students.

* Bringing homework, I will not accept, because they will be helped by their parents or brothers. I want them to do on their own. If they are helped I don't think they will learn.

Appendix X

VALIDATION 2

1. TEACHERS TEACHING METHOD

1.1 I don't have problems with teaching mathematics as long as I give students lots and lots of exercises

1.2 In examination, the examiners always follow the questions from the workbooks and previous question papers, So I just follow these questions during my classwork

1.3 I call some students to solve the exercises I wrote on the blackboard infront of the other students. A lot of blackboard work is very clear and easier for the students to understand

1.4 I always start the lesson discussing and revising the past lesson by writing some of the questions that most of the students could not answer on the blackboard, and after that I will give them worksheets to do individually

2. INFLUENCES ON TEACHING METHODS USED BY THE TEACHERS

2.1 I am still not sure the new method of teaching mathematics I learned from the teacher training work for us in the classroom. Because I said, the most important thing is that they can answer the questions in the examination.

2.2 I use the same method of teaching use by most of the teachers so that the students will not be confused. Furthermore, this teaching method sometimes successful to make the students able to answer the questions given to them.

2.3 If the topics in the syllabus not thoroughly covered, and the questions from those topics come out in the examination, that means the result of the students is not good. I will be blamed that there is something wrong with my teaching.

2.4 When the students do the exercises, I want them to do the exercises individually. If they are help they become lazy and rely on the smart students, I don't think they will learn.

3. INFLUENCES ON THE PUPILS LEARNING

3.1 Doing a lot of exercises moytivate the students. Doing activity, they don't consider that as learning seriously. They consider activity for small children.

3.2 I think the teacher is a very strong influence on the pupils learning. If the children respect the teacher, they will learn more from him.

3.3 Asking the students to do exercises on the blackboard infront of the other students make tthem feel confident. To show to the other pupils that the pupils who do the work is intelligent as the teacher to do the work on the blackboard.

3.4 The students like to show off to their friends when they get correct answer. They want to know who pass or fail in the classwork. This is an incentive and motivation for the students to learn more.

4. HELPING PUPILS LEARNING MATHEMATICS

4.1 Students do not understand the English language. So I use a lot of blackboard work so that even if they don't understand, the students can see, not hear.

4.2 I ask the students to look for keywords and clues in the questions. It is easier to look for these clues because by looking at one word they know what to do with the question.

4.3 Solving word problems in difficult topics like fraction, we give tham lots of questions to do to practice. The more they do the exercises the more they will understand.

4.4 To get more time to teach mathematics, even every morning from 7.00 am to 7.30 am we give the students remedial. And the remedial is always for mathematics. Sometimes I use Art and P.E periods as well for mathematics.

5. TEACHERS' ATTRIBUTES TO THEIR STUDENTS

5.1 The students are lazy, they don't bother to study eventhough the teacher tell them to revise the lesson.

5.2 Many of these students really need help. If they are confuse about how to do the exercise they keep quiet. Some of them will call the teacher, but some are very shy.

5.3 I really want them to concentrate on the blackboard. If I start to group them, nery difficult to get their full attention because they are talking to each other.

5.4 When the students are doing exercises in groups they will copy from each other. They rely on the clever students. Only the clever ones can do the exercises, the slower ones I don't think they can pass.

5.5 The students are very poor in Englisj language. To make them understand word problem is the biggest headach for the teacher.

5.6 The students are always forgetful, especially during the examination. Suddenly they cannot remember, as if they never seen the question before.

6. FEELINGS ABOUT MATHEMATICS

6.1 Actually we are not happy, because we are rushing, and we are teaching for the sake of the examination, not for the sake of motivating the students.

6.2 I am not comfortable with teaching mathematics. But I am trying my best to make my students understand my lessons.

6.3 Depend on the topics, sometimes the topic is easy and sometimes complicated. When it is complicated, even we, as teachers, feel not confident to teach it.

6.4 I like mathematics. So far I don't have problems with teaching mathematics except my students. They somatimes forgot what they learned.

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